# PUBLIC DOCUMENTS OF MAINE:

1902



BEING THE

# ANNUAL REPORTS

OF THE VARIOUS

# DEPARTMENTS AND INSTITUTIONS

## For the Year 1901.

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## VOLUME I.

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AUGUSTA
KENNEBEC JOURNAL PRINT
1902

FARM BUILDINGS OF MR. CYRUS CHASE, WESTFIELD.

# AGRICULTURE OF MAINE.

FORTY-FIFTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

# BOARD OF AGRICULTURE

FOR THE YEAR

1901.

PRINTED BY ORDER OF THE LEGISLATURE.

AUGUSTA
KENNEBEC JOURNAL PRINT
1901

STATE OF MAINE.

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*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 1901.

B. WALKER McKEEN, *Secretary.*

AUGUSTA, December 31, 1901.

# MAINE BOARD OF AGRICULTURE, 1901.

## OFFICERS.

E. F. ALLEN, PRESIDENT.
NAHUM HINCKLEY, VICE-PRESIDENT.
B. WALKER McKEEN, SECRETARY.

MEMBERS CHOSEN BY AGRICULTURAL SOCIETIES.

| | | |
|---|---|---|
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| Aroostook county, | Cyrus Chase, | Westfield. |
| Cumberland county, | John W. True, | New Gloucester. |
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| Hancock county, | Nahum Hinckley, | Bluehill. |
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| Knox county, | E. E. Light, | Union. |
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| Sagadahoc county, | J. F. Buker, | Bowdoinham. |
| Somerset county, | Ansel Holway, | Skowhegan. |
| Waldo county, | Joseph Ellis, | South Brooks. |
| Washington county, | E. F. Allen, | Columbia Falls. |
| York county, | S. H. Garvin, | Acton. |

MEMBERS FROM UNIVERSITY OF MAINE.

Pres. A. W. Harris.
Prof. Chas. D. Woods.

ELECTED BY THE BOARD.

B. Walker McKeen, Secretary.

# MAINE BOARD OF AGRICULTURE.

## INSTITUTE PAPERS.

### PRACTICAL ROAD BUILDING.

By J. O. SANFORD, Stamford, Vt.

(Stenographic Report.)

The question of road improvement has been under discussion for some ten years, at least, in the New England States. I think it was taken up in Vermont in 1892, and in Massachusetts and most of the other states at about the same time. As far as I know, every legislature in these states is now wrangling with this question of the improvement of the roads. Why the great importance of this? Because roads are essential, and because roads have not improved in the same ratio that other things have improved. We have improved our buildings, we have improved our cattle and our horses, everything with which we have to do in our civilization has been rapidly changed and greatly improved, but we have the same old roads. A class of people are saying to us that we must have roads built right away just like the roads of the old country. They return from the old countries and tell us that they are ashamed of America. It has the poorest system of roads of any civilized nation. They say that whereas the condition of the public roads is assumed to be an index to the civilization of a people, in this case it does not prove to be true, for we boast of our civilization, and yet have these poor roads. There has been a great deal of discussion on the subect, and it is still going on. The drift of opinion is that we should build scientific roads. You expect me to come here to-day and advise you to engage in the enterprise of building scientific roads here in Maine,—Macadam roads, but I am not going to do it. I try to be reasonable about this matter. I admire the Macadam roads and like to see them built, and they are being built in all the states, as far as I know. In our own state of Vermont we are making grand progress in the building of those roads, but it is in the cities and large villages, which have machinery for building them, and means to pay for them. I have no concern about the cities and villages, my concern is for the rural towns. My home is in one of these rural towns, and I have always lived in one of them. I am acquainted with their conditions, and I have watched with sadness the decline in population, and the decline in wealth, and the decline in agriculture, in rural New England. It has distressed me. I have studied the question deeply, and if there is any one thing that will check this decline, in my opinion, it is the building of good roads, and the maintaining of good roads. With good roads and good schools, rural New England will take care of itself.

In our own state the leading men are doing a great deal in the way of advertising the natural scenery, for the money they can get out of it, as a business proposition. If this same expense was put into practical work in improving our roads, these natural attractions would advertise themselves, for when we have good roads in this beautiful country people will not keep away from it, and when there are good roads and good schools, the people that are here will remain. Where can they find a better place?

Now, what shall we recommend for road improvement? I do not see that it is possible to make any very radical change in the rural sections of New England. We notice what Massachusetts is doing below us,—building these expensive Macadam roads in the rural sections of the state, and we watch it with deep interest. Many people in Vermont think that is applicable to Vermont; and probably many people in Maine think that is the way roads should be built in Maine. But I am doubtful of the project. I doubt if Massachusetts will extend her work much farther in the rural sections of the state. She has expended something over $2,000,000, and has built over 200 miles of Macadam roads. She started with the project of building here and there a mile in the rural sections as an example, so that the local people would extend it. But do they do it?

Never in any instance within my knowledge have they extended these roads. They wait and in the proper time apply for more road. It is too expensive for a rural town.

Again, the expense of maintaining these scientifically built roads is very large. It has been thought, and is thought now by many, that when a stone road is properly built after the Macadam system, it is built forever; no repairs are necessary. In New Jersey more than 1,500 miles of Macadam road have already been built, and the people are well pleased with it. But their conditions are different from ours. Their farming is market gardening—truck gardening—and the farmers cart their produce to the city every morning. They are pleased with their roads, but do you know that it costs on an average $60 a mile a year to keep those roads in repair? It surprised me to learn this; it surprises every one. When the authorities from Washington sent an expert to learn the cost of maintenance of those roads, they found that it was $60 per year per mile, after the first year's use. In Vermont the expenditure for road maintenance is about $33 per mile throughout the state, and we claim that our roads are improving. We hear more of the cost of maintaining these roads from Massachusetts. When the advocates of the system ask for the yearly appropriation each year, they are met with opposition, and this is one of the great arguments that comes up against them. It is urged that it is a burden to the state to maintain these roads.

So I cannot come here and conscientiously advise you to bend your enegies in the line of attempting to build Macadam roads in the rural sections. They are adapted for cities, they are all right there, where they can be built and have the proper care, but in rural sections like this, where the roads are as dry as yours are to-day, what would a Macadam road do? It would dry up and blow away. When a Macadam road loses its moisture it ceases to bind together, it unravels and wastes rapidly. So, though I am a little out of the usual order, I am not advocating the Macadam road. I will tell you what I do recommend and advise. It is that we wake up and realize our situation; realize that something must be done, and do that which is within our means and within our reach. And what is that? We should change our methods. What has caused this great agitation? Our methods are wrong; we are not building roads, we are just trying to hold these old roads that have come down to us from former generations, and treat them reasonably, by force of habit. We should guard against those things in our nature that have come to us by force of habit, rather than otherwise. This morning I witnessed an example of just what is going on. I did not know that we should find it in Maine, but I have talked myself hoarse against that same practice in Vermont. I should presume there were a dozen men at work. Three spans of horses were hitched to a road machine, with two men upon the machine, and they were tearing up the earth that has settled hard and firm for this year. They were scraping upon the surface of the road-bed sods, weeds, grass and mud,—miserable material. If I were a tax payer in that town I would not rest until the practice was stopped. It is all wrong. Building a road? No, no! You cannot build roads out of grass, or sods, or mud. Do not waste your money in any such way.

I do not condemn the road machine, it is one of the best implements that we have connected with road management, but I do condemn the bad use of it. That machine should have been brought out as soon as the snow was off, as soon as it could be operated, when the road was soft and plastic and could be moulded. Then one span of horses would do more than three will do to-day. Then put the road in shape with your machine where it needs it, and wait for those influences that the Almighty has provided for impacting and settling the earth, and then you have a road-bed that is solid. It may be done through ignorance, and probably is, but to my mind it is wicked to go around the country at this season of the year (June) and later, tearing up the earth. The material that those men were putting on the road in dry weather will make dust and in wet weather will make mud. That road never will be so well impacted again this season, the impacting influences have passed. I believe that as a general rule it is a mistake to operate the road machine after the ground gets thoroughly settled in the spring. There is a better way, and we are adopting it in Vermont. Many towns have been operating on a different line, a reasonable, intelligent line, laying out the money that the people have earned and paid in as their taxes in a conscientious way, with judgment.

The railroads have been built in this country, many of them, since the memory of men living here in this community. I remember when many of them were built, and what an enterprise that was! It may not be generally known that for 100 years our general government was engaged in building highways in this country. The great Cumberland road was built at the expense of the general government, crossing many states, extending to St. Louis. Great enterprises were in project. And they discovered that the power of steam could be used on roads, and evolved the railroad, and commenced building it. And you know that we have read about it in the papers every day for years and years, we have heard it in the pulpit and read it in the magazines, and it has absorbed the attention of the people and absorbed their money to the amount of more than ten billions of dollars. One of the greatest enterprises in the world and one of the great marvels of the world to-day is this great system of railroads. Some of those railroads have been put in operation within my memory, and I can remember how they were first operated. They were operated by the ideas that prevailed in taking care of roads. When an accident occurred, the place was fixed; when a bridge broke down, another was built; when the rail ties were rotted, new ones were put in. How long did that method continue? It could not continue very long. The railroads would all have gone into bankruptcy. It cost too much. It would seem like economy to some people to manage business in that way, but it is not, it is extravagant. To let your road alone until you are obliged to fix it and then fix it, is extravagant. They were forced to adopt a method of road management adapted to their business. Every rod of the road for years has been under the eye of a reliable person every twenty-four hours. They have adopted a system of continuous attention and care. Could anything be more economical? Every manufacturing industry in this country is working along the same line, watching to see that everything is in perfect order. If you will show me a factory in this country where the shafting is irregular, wabbly and untrue, and where the machinery does not run smooth and plumb, I will show you a concern that is on the road to failure. But you cannot find them, they cannot live. I believe that we ought to apply that to our roads. I want to recommend to you to bring about such a system in the management of your roads here in rural Maine. I know it is difficult to bring about a change in this matter. The road question is the most difficult one to contend with that I know of, more difficult than the school question. I think all the New England States give state aid to schools, but it is only when the schools are running. You must have your schools in order to get the state aid. State aid for roads becomes more difficult, because the roads are constant and continuous. But with or without state aid we should adopt a plan that is intelligent, and I can conceive of no better way than to take pattern somewhat from the management of the railroad, in the *maintenance* of our roads. I am not talking about road building yet.

In order to be successful in improving our roads, the first thing we should do is to take an interest in them, discuss them. We have made great progress in Vermont by beginning in our farmers' institutes. We began to talk there in 1892, and were surprised to learn that no topic we presented to the farmers seemed to be of greater interest, for they were realizing that the greatest burden they had to contend with was poor roads and the great expense of maintaining poor roads. Agitate this question, talk it up with the idea that it will formulate itself into a system.

The next step to take is to select a man as road commissioner who has a fitness for the work, if possible. Do not consider any other quality. If there is a poor man who needs a job, do not let that interfere at all. Do not let sympathy or sentiment affect the question. Use judgment, and select a good man. So much care was taken about this when the law was framed in Vermont creating commissioners that instead of leaving it to the selectmen it was provided that the commissioner should be elected by ballot. The law says he shall have at least $2.00 a day, and as much more as the town will pay, and I know of several instances where towns have had one man since 1892, a good man, and pay him $3.00 or $3.50 for his services. It should be a man who has skill, who studies the road question, thinks about it, puts it first, and makes a success. It is of a great deal of importance that you get the best man you can in your town to take this office; and when you have tried him and found that he is a good man, keep him. The amount that it costs while new men are experimenting with the roads as officials cannot be estimated. When you get a good man, keep him, and when he does a good thing, praise him; and when he does a thing that you do not quite agree with, keep still about it and watch it. Perhaps it will result to your satisfaction later on.

If you have selected a man who is interested in this matter he is studying the question all the time. It would be a wise thing for him to put himself in touch with those men who are in this movement, and with the literature of to-day. There is an office at Washington established by the United States government called the office of road inquiry. The literature sent out from that office is of great value to those who are interested and are working along this line. Those bulletins will cost him nothing but the postage, if he will apply for them.

What will this commissioner probably do? I say he should abandon some of the old methods, because these are what has made the mischief. This agitation suggests that there needs to be a change. Take the railroad for an example. How is it kept in perfect order? This suggests section men. We know that when the snow melts in the spring and the water runs off there are ruts, and the water carries away much valuable matter as waste. That should be stopped. But how can a man be in every part of the town? He should be. He is elected for the whole town and should be there. His spirit should prevade that town, as far as roads are concerned. He should have his section men, somebody to see that this waste, this depredation, does not occur. I will tell you how this is done in our state. The road commissioner, knowing all the roads of the town and the uses to which they are put, and knowing the inhabitants upon these roads, formulates in his mind a system of management, a plan for the year. He selects a certain man to take charge of a piece of road near his residence, in which he will be interested, and so on through the town. This is being tried in a good many towns. In some towns it does not work as well as in others. Some commissioners say they are bothered to get good section men, but the fault is not so much with these men as it is with the commissioner. He should embue them with some of his own spirit. I remember when I put this system in operation in my own town. We were in a bad condition as far as roads were concerned, and I adopted this radical change,—radical in that town. When I had wrought out this plan in my mind, I went and talked with the men that I had chosen for section men. I did not send word to them, I should not expect to have efficient men in that way, but I took my team and went to see them personally, and carried each man a book with his name written on the cover, and inside, the metes and bounds of the section of road that he was to guard, and begged him to help me. I said, "You know the conditions here. I have these roads on my hands. Our taxes have been excessive. I want to try a change and I want you to help me. I want you to take this pass book and take care of this section of road." A man told me a few days ago that the great trouble with this road business is with the people. He said that if a man saw water running down the road he would not turn it off. I said, "It is not his business to do it. It is his function to be a citizen of the town and this thing ought to be done by the town commissioner. You ought to have elected a good road commissioner, and he should have had his section men to look after these things." It takes quite an effort to awaken the right spirit in these section men and get them interested. We should say to them, "I want you to look after this road after every shower. You know that it is the water that destroys the road. These country roads never wear out. They wash out and freeze out and go to waste by neglect, and nothing else. We want to stop that and I want you to help me. Charge in this pass book every time you go out to look after the road, and charge enough. I shall see you occasionally and pay you." Where the commissioners have taken some such way as this they have had no difficulty in getting good section men, and all the slight defects are remedied at once. Another important thing in connection with the establishment of section men, is to have them provided with good tools. A great many towns have a road machine, but a majority of them have nothing further. We are handicapped; we are away down in the A, B, C of this business. Each of these section men should be provided with a new shovel, one of the long handled, round, pointed shovels, and he should always carry it with him on the road. This keeps the road free from loose stones that are not only a nuisance to the travel but a great injury to the road. Every time the wheel strikes one of those stones it grinds and tears and destroys the road. We cannot afford to have them in the road. This section man keeps the loose stones off, keeps the ditches clear, and keeps the culverts open. Here is a place that is getting low. A little mud hole is beginning, and next year it will take a crew of men to fix it

Now a few shovelfuls of material remedies it. I was literally astonished to see how the roads improved in our town, and I was greatly astonished to see how little it cost to maintain them. This is an economical method of road maintenance, in my judgment. In some towns in our state we have ranges of hills and valleys between, with thoroughfares running through them. It has been found that the most economical management of these thoroughfares that have a lot of hard traffic upon them, is to have one man working constantly upon them all summer, instead of periodically working them as is being done too much. In my own town we have a road six miles long where more than 100 teams pass daily, many of them heavily loaded. We had paid out more than $1,000 a year on that road, and it was in a miserable condition. We employed one man to work the road alone all summer. He paid $40 for a horse, and the town bought a cart and harness, and he worked that road alone. He began at the lower end and worked a mile the first day; the next day he worked a mile. It took him six days to cover the road, and the next week he did the same thing, and he did it all summer. His bills at the end of the summer were $255 (he took some of the haying season for work in the field), and we had a better road than we had had since the memory of man. He used good judgment in the selection of material, and took some pains to find the best, and that is what you ought to do here. Do not use poor road material, for in all road building the material is not five per cent of the cost. His method was to put this material into the very first mud holes, right in the center, paying no attention to the border. This was a wide thoroughfare. And at night he went over this section and picked up all the loose stones, and put them where they would never be touched again. It revolutionized the roads in that town. At the next annual meeting the town voted to elect the same commissioner for three years, and that he continue the same method. The expense of road maintenance was cut down more than one-half, and the roads were better than ever before. I state this to you, gentlemen, and ask you to do what you reasonably can to bring about a better system of road maintenance.

Now, in regard to road building, I have raised my objection against the Macadam road,—the expense of building it and the expense of maintaining it. It is a good road and beautiful to ride upon, but you have to pity your horse. A gravel road is better for a horse. I am greatly in favor of gravel roads. We are building them for $200 a mile, whereas the Macadam road costs more thousands. We are doing it in a small way. Every town in Vermont this year is building a section of what we call permanent road. We have no stone crusher, but we do it in this way: The road commissioner, after advising with the selectmen and usually with the principal tax payers, decides what section of the road shall be built this year. Then the first thing to do is to study the road, learn its history and find out what the trouble is with it, what has tended to make it bad. Some section of road may look well enough now, but the mud may be 2 feet deep on it in the spring. We know that water is a great destroyer of roads and if that mud is caused by water we should find out where the water comes from, and drain that section of road. The first essential is drainage. Does this water come from springs, and if so, where are they? They may be under the road, they may be around the road, they may be over in an adjacent field ten rods, perhaps twenty rods, away. I have known of such instances, where the water, percolating down a hillside through the earth saturates the bottom of the road. There is no remedy until you get rid of the water. In that case you should go over in the field and ditch the water off.

Perhaps there are certain underground conditions that in the spring of the year when the frost is coming out cause this mud, without springs. We have found such conditions and we have found out that what that road needs is a foundation. No road amounts to anything unless it has a foundation. A road needs a foundation just as much as a building. A road is a permanent thing, as well as a building. You have roads that have been here 100 years and will be here for 500 years.

Another source of bad roads is the water standing in the deep ditches at the sides. It distresses me to see these deep ditches as I travel around. Some of these roads were made years ago when the turnpike road was talked about so much. What is the effect of that? Through the fall months that water moves through the earth just as water moves through a sponge, by capillary attraction, and before winter comes the whole road-bed is saturated with water. Then it freezes, and expands about one-half, and you have every particle of road material separated from every other particle by ice. It makes a splendid road as long as it is frozen, but when it thaws it is deep mud, all caused by water standing by the roadside, which never should be allowed. Fill the ditch with earth, or anything that will exclude the water. If there is no other outlet let it flow over the road. You cannot have a good road and have water standing around it or upon it. Many times after the road machine has been along there will be hollows where the water stands. The best thing the road commissioner can do is to return and fill those hollows with earth.

When that section of road is thoroughly drained, we proceed to consider the foundation. Fortunately, in New England much of our soil affords a good and sufficient natural foundation. In that case we build right on the old road. In Vermont we take these old walls of stone, wherever we can find them, and build a foundation right on top of the old road. Sometimes we excavate, where we think there is trouble beneath. But whether it is on the surface or in an excavation, always lay the stones by hand. I have seen it done the other way, but it is always a failure. Stones should always be placed by hand, and one general rule should never be overlooked, which is to place the big ends, the base, down, and leave the points sticking up. If you have a long flat stone, do not lay it down flat, stand it up. It does not matter how jagged they are. We do not make this stone work more than six or seven feet wide. When the stones are packed take a stone hammer, anywhere from four to six pounds in weight, and break off the projecting points. Then throw the smaller stones in, and these, with the fragments, will fill the interstices, and you are making a scientific foundation. That is the telford foundation, such as they are building in the city of Lewiston, the city of Portland, and other cities. They usually get granite blocks, but it is the same kind of a foundation.

The next thing is the surface. In all road work we should have an idea of what a road is. I looked in the dictionary and I could not find a satisfactory definition, but I looked until I found it given by John L. Macadam. He says, "A good road is an artificial floor, forming a strong, smooth, solid surface, capable of carrying great weight and over which carriages may pass without impediment." We should adopt that as our ideal and work towards it. We do not expect to complete it in its perfection but all we do in this road building should be done along these lines. We should make this artificial floor, some call it a roof. It should shed water; if it does not it is a failure. Now put on the gravel, using good road material. Cover the stones and round it right up in the middle not much wider than the wheel tracks. You say it will be disagreeable to travel. We are building a road, we are not considering convenience to-day. The wayfarer will come along and will try to shun it. You should put obstructions along the road to keep him on it. He should contribute his part in making the road. The proper way is to put on a steam roller of twelve tons, or a horse roller, and I should advise many towns that have the means to buy a roller. But this must be done when it is wet. Then you can put on more material and roll it down again, and you have a road just as good as a Macadam road. But we have not the roller, hence the importance of keeping the travel upon it. Soon it becomes slightly rutted, and after a rain you should take the road machine, setting it light, and walk the horses rapidly over it. Keep the road in shape, do not ever neglect it. In the fall, about a week before it is to freeze, take the road machine, set light, and go over it. I have covered ten miles a day with the machine. It scrapes up the gravel that is working towards the ditches and will be lost; it fills the ruts; it keeps the surface of the road smooth, so that it will shed water, and will come out right in the spring. This is economic road management, and I urge you to consider it, and as far as possible adopt it.

Ques. What do you do with the bushes that grow up beside the road?

Ans. It is the duty of every commissioner to cut the brush and keep the roadsides clear to a certain width, I think it is eight feet from the center of the road. If you have a good road commissioner he will see to that. And he will see that the natural beauty and the natural attractions of the roadside are not marred. The road commissioner should cut the bushes, and when he cuts them he should carry them off and burn them. As I was riding in Maine last Wednesday, from Portland to Livermore, I was looking at the highways, and one thing pleased me very much,—there were no fences by the roadside. It was clear. I have not seen it in any other state. I have been in New Hampshire and I have been all over Vermont, and I am distressed to see the rubbish on the roadside. Farmers clean out their cellars and dump the rubbish on the roadside. Our tired wives and mothers like to ride out, not for the exercise but for the holy heavenly influences that come to them through their senses, for what they see, what they feel. These New England pictures that we get from the highways far surpass the works of art. Keep clean the roadsides.

Ques. Would you adopt the same method in keeping the bushes down as in keeping the highway in repair?

Ans. Certainly. It requires constant work. If you allow the bushes to grow you have a large job to do sometime. There are also certain trees that do not add to the beauty of the road and are doing great damage. These should be cut down. In some instances we got the consent of the owners and cut down maple trees because under those trees there would almost always be a mud hole.

One word more: I see you have culverts here, and I want to advise you never to build any more of those old wooden culverts. They are always out of repair. Build them of stone. If you do not have stone build them of glazed tile, such as is used for sewerage purposes, being sure to have it large enough. It is about as cheap a way as you can make a sluice and when properly laid and protected, it is permanent. If you lay them in clay I would advise going a little deeper, perhaps six inches, and filling in with sand or gravel. Do not cement the joints, as in freezing the ground moves a little and it will break. Put gravel around the sides and tamp it in, and cover with gravel or earth, and then protect it in some way. Some use flat stones and some use old planks or something of that kind. If you cover it one and one-half feet deep with solid earth it is sure.

## ORCHARDING.

By John W. Clark, North Hadley, Mass.

(Stenographic Report.)

The first thing to consider in the growing of an orchard is location and soil. The soil for an orchard should be moderately strong. I should not want to set an orchard on light, sandy land, neither would I set it on wet land. I would rather set it on land that is a little high than on low land. Some varieties do better where it is a little low, but the Baldwin is somewhat tender, and if planted on low land it is apt to winterkill more or less. Of course your conditions are different from those of Massachusetts, but the Baldwin here in most cases will probably be hardy on the higher ground, if it is not too wet. I should select a location a little above the ordinary level of the country, and with moderately moist, strong soil. And I would not select a location where I could not plow. You have land enough on your gradual slopes that can be plowed. I am surprised that you have so few stones, and so much land that is ideal orchard land. I do not say that an orchard cannot be grown if the land is not plowed, but as a rule it will not do as well, and I should hesitate to set an orchard where I could not cultivate.

The next thing to be considered is varieties. I have been criticized some since I came here when I have condemned the Ben Davis. I know it will bear early, and sells well; but the Ben Davis does not belong here. It belongs to some other section of country where the season is longer. Every section of country has its apples. Massachusetts has its Baldwins, Russets, and Greenings. These are its main winter apples. In Northern Vermont they have the Northern Spy, Snow, Greening, and the Baldwin. Northern New York has Kings, Northern Spies, Greenings, and as you go a little farther south in the state, the Baldwin. In the Missouri valley they have the Ben Davis, Janet, Wine Sap and Jonathan. And as you go south they have the Smoke House, the Shockley and varieties we never heard of. Here in Maine you have the Harvey, that we see in the Boston market, the King of Tompkins County, Spy and Snow, which do not do anything with us. In selecting varieties, select those that do well in your locality. And select them not because you like them but because they will produce well in your section and the market calls for them. But you may ask, Why do you say anything against the Ben Davis? I am afraid the market will not continue to call for the Ben Davis. It does not belong here, the season is too short. Out in the Missouri valley and through that section, Ben Davis apples can be grown much larger than those grown in Maine, and they are better colored, and the flavor,—is not much worse. If I were setting an orchard here, and had a place where I knew Baldwins would do well, I would set Baldwins for the permanent trees, setting them twenty-four feet apart each way, as I have set my own orchard. Now I am cutting out every other tree, and by and by, when they get too thick again, I shall cut out every other tree again, leaving them forty-eight feet apart, which is none too far for a tree that makes the growth the Baldwin does. I would set every other tree a Baldwin, for the permanent trees, then between I would set either Ben Davis, McIntosh Red, Wealthy, or some other variety that is smaller in its growth and bears earlier than the Baldwin. In this way I would get four, five, or six crops of fruit before the Baldwin begins to bear, and then I would cut out these trees as the Baldwins needed the room.

In regard to the growing of an orchard, an orchard should be cultivated. I know that some of you will not agree with me, but I would not set out an orchard where I could not cultivate it at least to the time of bearing unless I had no land that could be cultivated.

Ques. What would you cultivate it with?

Ans. First I would take the plow, and plow before planting. Then I would take the wheel harrow and harrow as though I were fitting the ground for corn. Some may ask if I would plant anything in the orchard, the first few years while the trees are small. If I had the money so that I could get along without doing this, I would not do it. If I had not, I might plant potatoes or perhaps corn for the first two, three or four years. But remember that if you plant you have to fertilize, and it is a great deal more work to plant and cultivate among the trees than in an open field. And then you must take back to the orchard as much as you take out of it, in fertilizing material, or the land will be growing poorer. When you do not plant you can cultivate both ways. If the land is not ploughed I should use a disk harrow, and start before the soil gets packed down in the spring, going both ways. If the land is on a hillside I would only use a wheel harrow going along the hillside for the first time to cut the soil, because when you get it loose the heaviest will settle down the hill and form a terrace on your lower row, so that you will get steps. After loosening up the soil, then take a spring tooth harrow and go one way, in a week or so go the other way, and keep this up all summer. If you want to hoe out the space left around the trees, you can, but a few weeds will not hurt anything. Keep the surface stirred so that a crust will not form and the land dry up. For cultivation is a question of saving moisture. There may be food enough in the soil but if it is dry the trees cannot use it, as they take their food up in solution and if there is not water enough to dissolve the plant food in the soil the trees cannot make use of it. The dryer the weather the oftener the soil should be stirred. I have a friend in Michigan who has eighty acres of peach trees. One year they did not have a drop of rain for three months, from May to August. The land had been under cultivation. He got four Breed weeders and put a horse and a boy on each and went over that eighty acres every other day during the summer. The man who lived next him had an orchard, and simply stirred it in the spring, and before the summer was over there was not a leaf on his trees. My friend's peaches grew, the leaves were large and green, and looked healthy, and he harvested a large crop of fine fruit, and got big prices for it, just because he stirred an inch or so of the soil, to stop evaporation. If I could have but one,—cultivation or fertilization, I would let the fertilizers go and take cultivation. On land of ordinary fertility you do not need to give your trees much fertilizer if you will cultivate them well until they begin to bear. It might be well when planting the trees to put on some ashes or other fertilizer to give them a good start, but aside from that you can make your trees do well by continually stirring the soil.

In regard to fertilizing the land, for orchard fruits, such as apples, pears, peaches, plums, etc., you can put on all the ashes or potash you wish and you will not hurt anything; you can put on all the ground bone, or South Carolina rock phosphate you wish, and you will not hurt anything. You should not use much nitrate of soda and you should not put on a heavy dressing of barnyard manure, for it is the nitrogenous matter in the barnyard manure that hurts the fruit. A little will do good, but too much will injure the fruit, destroying its keeping qualities. Do not take either extreme, but follow the middle line, and if your tree is looking well, keep right on. If it is growing too fast, give it less fertilizer, and perhaps it would be well to stop cultivation one year. You can tell by the foliage and growth of the tree what it needs.

Ques. Can you get under the trees with horses, to cultivate?

Ans. If the trees are grown right, you can. Of course if an orchard has been left to itself it would not be possible; but as the trees grow you should trim them. You should have in your mind the shape you want your apple trees to be when they are matured, and in your pocket a jack-knife, and cut off a little limb here and a little limb there as it is needed. Trim your trees as they grow to the proper shape and then you will not have to cut off limbs of any size, except such as get broken, etc. The pruning should be done in the early life of the tree. I should prefer the head a little thick rather than too open, because when the tree begins to bear the weight of the fruit bears the limbs down and they never quite get back, the head grows more open. With the trees trimmed in this way there will be no trouble in working the orchard with horses. I use them in my orchard. If I had an old neglected orchard I would get a good saw and take out all the dead limbs. Then I should cut out the larger portion of the brush inside, leaving perhaps once in a while the best of the suckers headed back to form a new head, if the tree was going to be a little thin. I would scrape away the rough bark, which serves to hide insects, and break up the sod.

Ques. After the bark is taken off is it not a good plan to whitewash the tree?

Ans. It may be and it may not. Probably it would not do any harm. I have whitewashed mine, and sometimes I thought I did more injury than good. I should not bother to do it, as I do not see much need of it. I should trim the trees and then carry the brush off and burn it, bring back the ashes and scatter about the orchard. Then I would put a pair of horses in and plow just deep enough to turn the sod; as you go near the tree do not plow as deep. Then I would take a wheel harrow and harrow it both ways thoroughly; if I thought the land was not in good heart I would get ashes, bone, potash and barnyard manure and scatter over the whole surface.

Ques. I have one orchard that I cannot plow, and I have put hogs in it. Is this a good plan?

Ans. I would not put many hogs into a small orchard, because they will do damage. If it is not too stony you can take a double shovel cultivator and jump it over the rocks, and tear up the ground a little, here and there, and then take a spring tooth harrow and go over it. Stones are a benefit to an orchard if there are not too many, because they hold the moisture. The most solid, perfect apples, that will keep longest, are grown near a good ledge, where there is enough of soil for the tree to feed on.

Ques. Would you recommend the Stark on valley lands?

Ans. The Stark is a western apple, sent out by Stark brothers, of Missouri. Nearly all of the western apples we have had anything to do with are poor flavored, and want a longer season than ours. I would not have too many varieties. A buyer does not want to buy apples of a man with forty or fifty varieties. He wants to find an orchard with three or four standard varieties. If you cannot grow the Baldwin or your lower ground, I think you can grow the Northern Spy. That apple will sell, and you need not be ashamed of it, and it will stand your climate. Perhaps if you should buy a Spy and top-graft the Baldwin on it you would have a more hardy tree.

Ques. Is not the Spy a shy bearer?

Ans. It is not an early bearer; it takes quite a number of years for it to get into bearing. But after it begins to bear it is quite a good bearer. Where it belongs, in Northern New York and Northern Vermont it is a heavy bearer.

Ques. If an orchard has been injured by over pruning and does not bear well how would you restore it?

Ans. The most of the orchards in this locality that I have seen have not been pruned enough. Some orchardists, if they have a tree that is growing too high, will sometimes cut out the whole inside if it is healthy, and start out suckers from the stubs: when these suckers grow they select what they want, and cut off all the rest and head back those that they leave so that they will branch out, and in about five years they get practically a new tree. You will seldom find apple buds away out at the end of a branch. Fruit spurs must be formed, so this new growth has to get a certain age before it gets ready to bear. Our apple blossoms this year were formed last summer. Look at a blossom bud in the fall with a glass and you will see the cluster of flowers. The apple is already formed, in the spring the blossom opens and the apple grows. The crop of this year was started last year, and the crop of next year is made this summer. So that if your trees are not bearing well you will probably get a better crop next year if you will go in and start the trees—put your plow in and stir the land—this year, and induce the trees to form more and stronger buds.

Ques. The orchard I have in mind has been pruned until there are not more than three or four shoots on the top. It is the theory of those who claim to know that those trees have run to roots too much. Would you not prune the roots?

Ans. No, sir. Bear in mind that a tree develops roots and branches proportionately. If it has few leaves it develops few roots, and if it has few roots it will develop few branches. A tree sheds its roots just the same as it sheds its leaves, that is, the working roots. It is the little roots at the ends that do the work. When the foliage ripens there is no more use for the little hair-like roots and they die. Where many of the branches have been cut off while the tree is in leaf, the use of the same portion of roots has been destroyed, and they have died or are diseased, else the tree would start out an immense amount of new suckers. If these trees have done that I should trim them up; if not, I should dig them up, as I do not believe they will ever be worth anything.

Ques. Where you plow an orchard and cut it with a disk harrow doesn't it injure it in any way?

Ans. Not at all. If your land is plowed when you start the orchard. and you continue to cultivate that land year after year the roots will go down and get below the plow. As the roots grow larger more care is necessary. Plow just as shallow as you can, perhaps not more than two or three inches when you get near the trees. If you do cut off a few roots I think you will be better off in the end by loosening up the soil. Sometimes you must do a little injury to get a great good. New roots will start and will form below the others, so that in a year or two the trees will have all they need and you will be surprised at what the orchard does.

The way that I care for my orchard after the trees have come into bearing is this: I have a fence in the middle of the orchard and one-half I plow one year and the other half the next. The half that I plow I keep cultivated until about the middle of August. Then I sow it to clover, and put some of the other fine grasses in, to furnish feed for sheep. I pasture sheep in my orchard. There are drawbacks to this, I know, but still I find that sheep will do the best of any animal, and my trees are in such shape that they do not do much damage. The half that I do not plow I pasture with sheep. Then the next year I plow this half, and after the grass gets up in the other half so that it is good feed I let the sheep in there. The clover enriches the soil, and the sheep contribute to its fertility. I would not put sheep in the orchard until it gets to bearing size, because they will ruin it; and even then if the bark is smooth care must be taken or the sheep may gnaw the trees. I should put but very few hogs into an orchard, and never cattle or horses.

In order to grow perfect fruit, free from insects, it is necessary to spray. In spraying there is a good deal of poor work done. Before you spray find out what you want to spray for. If it is an insect find out whether it gets its living by eating or by sucking. The caterpillars, canker worms, leaf rollers and codlin moths get their living by eating. Use Paris Green for all these. But the plant lice on your plum trees, cherry trees, and the new shoots of your apple trees, get their living by sucking. They have a little tube which they push into the bark and suck the juices from underneath. You cannot poison these. They do not have lungs as we do, but breathe through pores in the skin, and you must put something on that will smother them, some sticky substance that will form a coating over these pores or penetrate their skin and destroy them.

Plant diseases, such as the apple scab, etc., are very different. The apple scab is caused by a parasitic plant which lives upon the foliage or fruit, and gets its living at the expense of the tree or fruit. Poisons will not affect it at all, and after it is once established spraying will not do any good. You must put something on the surface of the foliage or fruit before the spores get there.

The best remedy we have for diseases of this kind is the Bordeaux mixture. This is a mixture of sulphate of copper and lime. It is a preventive and not a cure. The regular formula for Bordeaux mixture is four pounds of sulphate of copper and four pounds of lime to fifty gallons of water. The sulphate of copper is in crystal form and can be procured at the drug stores by the pound at 10 or 12 cents, or by the barrel or hundred pounds for about seven cents. I mix it in this way: I take a kerosene barrel or sugar barrel and cut it open, making two tubs, and if I want more I cut open more barrels. I slack the four pounds of lime in water just as if I were making a whitewash, and put four pounds of sulphate of copper in a bran sack or loose bag, then put about four pails of water in the other tub and hang the bag in the top of the water. If you put the sulphate of copper in the bottom of the tub it will dissolve very slowly, but if hung in the top the four pounds will dissolve in about half an hour. Then I fill the barrel nearly full of water, leaving room to put in the dissolved sulphate of copper and lime. I strain in the lime through some cloth like a bran sack, and then stir the mixture thoroughly. You can put Paris green in at the same time, to kill insects. You should put in at least one-third of a pound of Paris green to every barrel of fifty gallons. Of course my spraying pump is on this barrel, and I stir the contents with the agitator until it is thoroughly mixed, and then two men take the hose and another man pumps. It takes about three-quarters of an hour to use the barrel of Bordeaux mixture, and we will cover about thirty good sized trees.

Ques. What is the lime put in for?

Ans. To neutralize the acid of the sulphate of copper so that it will not burn the leaves.

If any of you have a large amount of spraying to do, as a test to know whether your mixture is right you could buy five cents worth of yellow prussiate of potash. Take a bottle, fill it one-third full of these crystals, and then fill it with warm water. Then when your mixture is ready just drop in some of this yellow liquid. If the mixture is all right, it will be yellow as it strikes, it will not change color. If there is not lime enough it will turn a chocolate color.

Ques. After you have sprayed suppose there comes a shower and washes it off?

Ans. If you can have a couple of hours of dry, warm weather, it will dry on the foliage and harden, and will stay pretty well. If you simply put Paris green on, the rain might wash it off, but when the lime and copper harden as they form a chemical union, it is not easily soluble, so it stays and holds the Paris green. It is very essential that it has a little time to dry, and when it once gets hardened the rain does not do much harm.

In regard to the time to spray, in old orchards I should spray just as soon as the weather is warm enough to work, before any buds started at all, with the Bordeaux mixture, without any Paris green. I should make the mixture strong, using six pounds of copper sulphate, because there is no foliage, and should wet the trees thoroughly, trunk and limbs. Then I should wait until the buds had started, and spray again, putting in Paris green this time. This is the time you have to look out for the bud moth, a little worm that works right where the blossoms come out. I should spray this time with four pounds of copper instead of six, just as the buds begin to open. Then comes the codlin moth, which makes the wormy apples. It lays its eggs on the fruit, after the blossoms fall. Do not spray while the tree is in blossom, but as soon as the white leaves or petals of the flower have fallen spray your trees again with Paris green and Bordeaux mixture. The fruit stands upright when it first sets, and at the top is a little cup. When the worm hatches it will crawl there, because that is the easiest place it can eat into the fruit, and you want to get your poison into that little cup ahead of it. You must get the poison into the cup of each little apple, or there is danger of the worm getting into the fruit. There is a second brood during the summer, but they do not cause much damage. We usually spray three and perhaps four times. If it is hot, muggy weather in summer, after the apples get two-thirds grown, and you are troubled with the scab,—a smoky, cloudy appearance on the fruit that is caused by a little plant, it is well to spray the trees again with the copper mixture, without any Paris green. You may say that where a man grows two or three hundred barrels he cannot afford to spray. I say he cannot afford not to do it. If you will not attend to your apple trees just the same as you do to your other crops, dig up your trees and give them up. You will not make any money in half growing anything.

In thinning apples, I wait until the apples get to be about one inch in diameter. Then I put up my ladder and pick all wormy and poor shaped apples off. Then I pick off all the gnarly apples, and pick off enough so that no two apples will hit. To grow a good apple it must have a good color, and where two apples hit they are not usually well colored, and they are apt to be wormy. If the fruit is thinned in this way the apples will be better colored, there will be fewer wormy ones, and the apples will be larger. There are just as many seeds in a small apple as in a large one, and perhaps a few more, and it takes more from the tree to develop the seeds in the apple than it does to develop all the rest of the apple. You will have just as many barrels of apples as if you had left them all on. Then, again, I pick these apples off and drop them on the ground, and the sheep follow and pick them up, and the worms are destroyed. Some of the entomologists tell me that the apples are so immature they dry up and the worm cannot come to maturity. I do not know how this is, but if the sheep eat them they are certainly destroyed. If I should leave the poor apples on the tree, some of them would be there when the apples were picked, and it will take just as long to pick the wormy apples and take them to the barrel as it does the good. If the apples are thinned it does not exhaust the tree as much, better fruit is produced, and one can get double the price for it. It pays you to grow the best fruit. Very little of the first dollar that you get for your apples goes into your pocket. It pays for the land, the barrels and other expenses. One year I kept as strict an account as I could of the expense of plowing, cultivating, spraying, thinning, gathering, hauling to the depot, etc , and I got my apples into Boston ready to be sold for about ninety cents a barrel. The first dollar does not amount to much. It is the amount above that which is the profit.

Ques. Did you put them in cold storage in Boston?

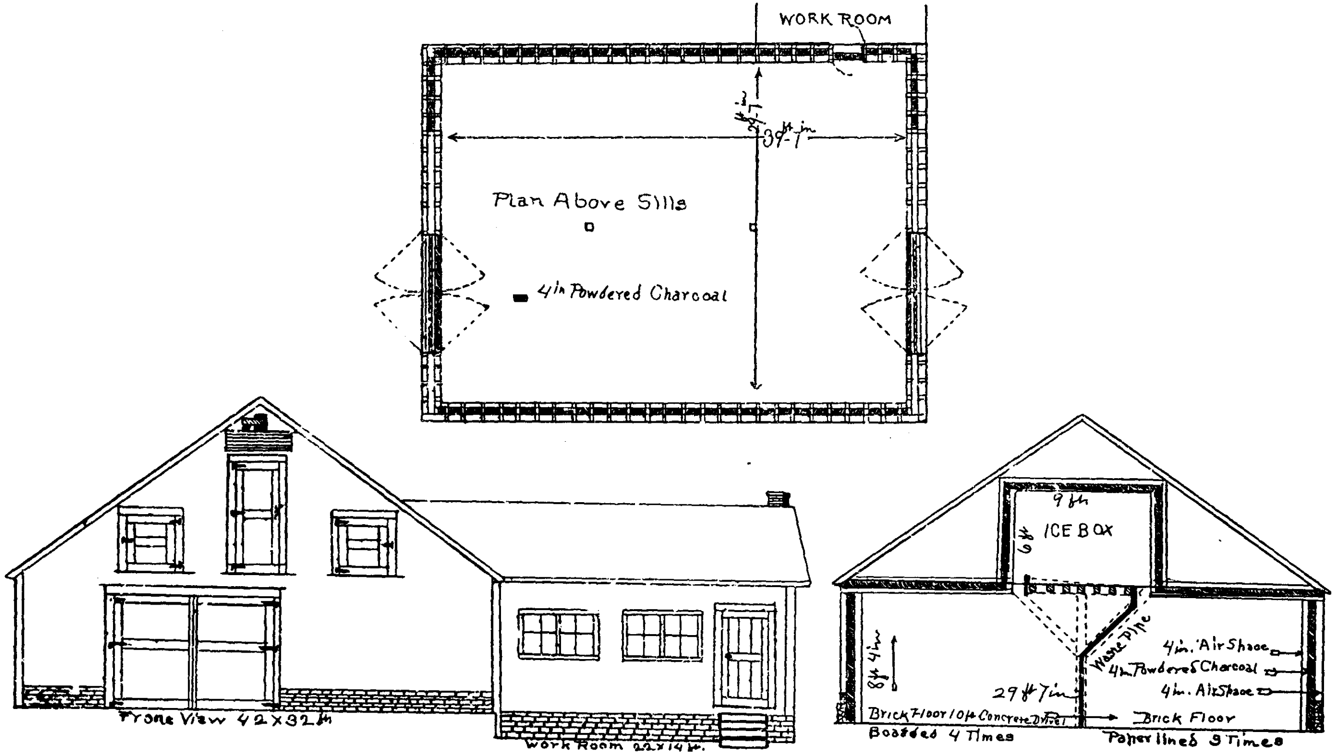
Ans. Last fall I put in about 500 barrels. I cannot tell you the exact cost, as I have not my figures, but about thirty-five cents a barrel from October to the first of May. Those 500 barrels that I put in last fall only shrunk about half a barrel. They began selling them the first of April. They were picked and put into the barrels just as quickly as it could be done, and drawn to the car and billed right to the cold storage house, and were not allowed to stand on the track out in the sun. Four days from the time they hung on the tree they were stored away. If you can get your apples in where it is cold right away it stops the shrinkage enough to pay for the storage.

Ques. How long will they keep after they come out?

Ans. It depends on how they went in. The secret of keeping apples is this: When an apple gets mature, it begins to ripen, which is a species of decay. When that apple is ripe, if it is warm, it begins to go back, and if it has once started to go back you cannot stop it unless you freeze it. If you put it where it is cool it will go more slowly but it is not entirely stopped and will gradually waste. Now if you can get it into this cool place before the ripening is started you can hold it there almost as long as you want to. The flavor may not be as good but the apple will not decay. Two years ago I built a cold storage house, thirty-two by forty-two feet. My way is to pick the apples in the orchard, throw out those that are poor and put the rest into the barrel loose, so that I can stand one barrel above another; and I have my team draw them to the house while we are picking, so they do not stay out over night, and pack them three barrels high. My ice is kept overhead. If I can keep those apples at 40° steadily I can keep apples just as long as they can in Boston at 32°, if they are sent there and it is a week or ten days before they get into cold storage. The first two days they let the thermometer go down to twenty-eight so as to cool the apples off, then they raise the temperature to thirty-two degrees, and there they let it stay day after day.

Ques. Do you use much ice?

Ans. Of course it depends something on the weather outside. If you put 500 barrels all in in one day you would find that for the first few days the ice would melt fearfully fast. Then as they begin to cool down the ice will go slower. The cakes stood on end, and the ice was perhaps fifteen inches thick. I put in about 150 cakes and filled it twice, and I threw out about one-third of the last filling in the spring. I made three sets of doors at each end, inside regular refrigerator doors, then the outside doors were simply common doors boarded three times different ways, so that they would not warp. Then there is an air space of about one foot between the doors. Between the inside and outside doors there are some sliding doors with iron rods, once in three inches. These doors I use on frosty nights to prevent




PLAN OF COLD STORAGE HOUSE FOR APPLES, BUILT BY JOHN W. CLARK, NORTH HADLEY, MASS.

men or animals getting in and disturbing the fruit, when the inside and outside doors are left open at each end of the house in order to let the colder air outside blow through the house and cool the fruit. In this way the temperature of the house is kept sufficiently cold with a much less quantity of ice. It is thirty-two by forty-two and seven feet posts, with a brick foundation, so I can stand one barrel above another three high and have a space above the upper barrel. It will hold about 1,000 barrels.

Some cellars are excellent for keeping apples and other cellars are the poorest places to put them. If you have a good cellar for them you are lucky, if not, keep them out of it until the cold weather comes.

Now I wish to speak of another thing. The growing of the apples is only half the battle. You can grow good apples and not get anything out of them. You want to know how to handle your apples as well as how to grow them, and if you cannot do that you cannot get a good price for them. Apples should be put up well. If you are sending them to market and they sell on their merits, you cannot afford not to sort them well. When in Missouri, to show what a difference there was in putting up apples, I thought I would try this experiment: I went to a dealer and asked him if he ever bought apples, and if he knew how to put them up. He said he guessed he did. I told him to put up three barrels of Ben Davis and have them at the depot at such a time. Then I went over to the station, and had six barrels of Ben Davis picked right from the tree. I packed them in two lots. Of one lot I made two barrels of No. 1 and one barrel of No. 2, and the other three barrels I called all No. 1. The apples which I bought of the dealer were just as good as they hung on the trees as those I put up. Then I told the commission merchant to take these three lots of apples and examine them carefully, taking time enough for it, and then sell them for what they were, just as if they were samples of a carload of each lot, and return me the proceeds after taking out enough for his trouble. The lot marked 1, which was the lot I sorted and made two barrels of No. 1 and one of No. 2, he sold for \$6.30. The lot which I packed and called all three barrels No. 1 sold for \$5.40; and the other lot sold for \$4.20. The apples in one lot were just as good as those in another when they hung on the trees, but I got seventy cents a barrel for handling and packing them as they should be.

In order to make money in growing fruit, you must grow the best fruit you can, you must spray, you must cultivate, you must thin, you must pack the apples as they should be, and put them on the market at the proper time.

Ques. Should the apple be sweat before it is packed?

Ans. An apple does not sweat, that is a wrong idea. It is simply this: The apple has been where it is cool, a cool night cools it off, then comes a warm day and the moisture in the atmosphere striking the cool surface condenses on that apple just the same as it does on a glass of cold water in a hot day. I should take the apples right from the tree and send them to market. Do not try to have your apples sweat, as you call it. If you are not ready to sell them, put them right into the cellar if it is a good cellar for apples; if not, put them on the cool side of a building. Keep them as cold as you possibly can.

Ques. How would you kill the green lice on plum trees?

Ans. The easiest way would be to go to the drug store and buy a pound of whale oil soap, take some warm water and dissolve one-fourth of a pound (it will not dissolve in cold water) and then put in enough water so that there will be a gallon; then put this into a dish and dip the ends of the twigs into it and stir them around so that it will hit every one of the lice. They are usually on the ends of the twigs. You may have to do this three or four times. If you have a force pump, you can spray the trees with the whale oil soap and water.

# POULTRY ON THE FARM.

By Mrs. IDA E. TILSON, Salem, Wis.

(Stenographic Report.)

I do not recommend every man, woman and child to go into poultry culture, but I have had a long experience in raising fowls and think I can, perhaps, draw the attention of some to the hen who have not realized all that there is in this business. Among the few good things that I have done, I have started several boys in poultry culture, and though some adults give up, I have never yet known a boy to fail. He is satisfied with a reasonable interest, anywhere from five to ten per cent, while a man is expecting about 200 per cent. I like to draw the attention of farm girls to poultry culture. While many girls are called, I have no doubt, to be teachers, I am sure that if some other girls knew the pleasure and profit derived from poultry culture, they might remain with their mothers, and the life of the mothers on the farm, with all her children away, is rather lonely.

## BREED.

I am often asked the question, "Which is the best breed?" I answer as I should if it were asked me concerning cattle,—if there were any decidedly best breed everybody would find it out, and everybody would have it. There is more in handling than in breed. Still, the Leghorns are the best laying breed, as the Jersey cows are the best dairy breed. You will find more good layers among Leghorns, just as you will find more good milkers among Jerseys. And so, with Brahmas and Cochins, you are sure of getting a good flavor in flesh. They have been bred for this. But you can handle Brahmas so they will be very nearly general purpose fowls. I know of a man who handles them in such a way. He does not give them corn, as they are inclined to be lazy. He makes them scratch. It is a good thing for a hen, as well as a man, to scratch for a living. Some people will take those Brahmas and give them pudding and corn and no exercise, and get them to be such persistent sitters that they will even sit in an ice box. While Leghorns are usually non-sitters, I have seen them so handled that they will become good sitters.

ACCOUNTS.

I have my grain for my poultry put in some bins or barrels by itself. Of course I could not measure every little quart which I feed, but I measure a quantity of grain and put by itself. And you should be sure that you are accurate. One poor woman, with whom I talked, said that her husband got the grain for the preacher's horse out of her poultry grain pile. Then I take the vegetables and put them by themselves. The sour milk I am obliged to estimate. It is worth with us eleven cents per hundred pounds for fertilizer. For years I have kept an account with my hens, and I can board them for sixty cents a year apiece. I was very much delighted when the Utah Experiment Station brought out a report in which it was stated that they were boarding hens for sixty and one-fourth cents. The New York Experiment Station boards the smaller breeds for eighty-four cents and the larger ones for ninety-eight to 103 cents, but that is regular hotel board. I just mention these figures that you may have some idea of cost. It is better that you should keep your own accounts. When I first began in the business I could get hens to lay only about ninety eggs apiece a year. When I got them to laying 117 eggs apiece a year I was very proud. Then, I remember that for four years they staid at 139. I labored with them, I fed them well, and finally I got them to 145 or thereabouts. I was talking with a man once who claimed that his fowls had laid about 200 eggs apiece a year. I felt very much ashamed that mine were so far behind, and I began to question him. I led him around and around, till he actually said, "Well, that is what they would have laid if every hen had done her duty." I make up my averages every month, I do not wait until the end of the year. I include every hen for what time she is in the flock. If she is eaten or sold in the middle of a month, she is counted as half a hen. You see this is not speculation nor imagination. I will say that I do not doubt the stories of the hen reaching 200 eggs a year. I did personally know of one flock of hens, fed almost entirely on table scraps, that laid about 190 eggs apiece. But these were pets. So I say that those large records belong to the people who have a few pets or those who are running poultry farms, and making a very intensive study of the business. I have always had housekeeping, or something else to do, and never had more than 200 to 500 hens on our farm.

DRINK.

The egg is seventy-four per cent water, yet people fail more often than otherwise in the water supply. I have measured the water which my hens drank, and a very ordinary hen under ordinary circumstances, will take five ounces, and frequently six ounces a day. If you multiply that by the number of hens, I think you will find that the amount you are giving them is short, sometimes. A lady who owned gold fish, once told the man who had charge of them that they needed some more water. He answered, "They aint drunk up yet what they have." That is the reason some people do not give their hens a fresh supply. But if those people did look at the water, they would see that it is very muddy and nasty, and with a fresh supply in a clean dish you do not know how much your hens might drink. The water in the egg is really distilled water. If you can pour cheap water through the hen and get it distilled and flavored and sell at a good price, why don't you do it? People are apt to fill the water dishes to just such a point every time, and there gets to be a green, slimy ring around them, and that is just where these little microbes like to live and multiply. I have a very fine dish cloth which I will recommend,—a cob with the corn shelled from it. This will scrape off slimy matter very nicely, and cold water will dissolve more than warm water. I clean the dishes out of doors, and set them to air nights. I am especially careful with milk dishes. Milk is a most excellent food and drink, but I have seen many milk dishes where I could run my finger around and scratch off rotten milk. This is a vile poison. If you should inject it into your arm it would very soon kill you. I would rather fowls did not have milk at all, unless great care is daily taken with the dishes. If you use the Cooley system you have sweet skim-milk, but it is liable to become sour later, and if you have a shallow setting you certainly have sour milk, and a fermented sour is apt to physic. I watch its effect and omit it now and then or put in one-third of a teaspoonful of soda to a pan. Sometimes I make sour milk into cheese for young fowls, which renders it entirely safe, if crumbly when done.

TABLES OF FOOD.

The model pound for the working animal contains about five and one-half times as much starchy matter as protein. I was delighted to find that Cornell Agricultural College had worked out the same ration. I would advise every one here to get from Washington tables of foods, which can be procured free upon application. It would be well to specify for stock, if you want them for stock, as naturally the grains would then be estimated uncooked. And hens can utilize gristle, marrow, bone, and cuts of meat that cannot be used in cooking. The analyses will show that there is a great deal more nutritive matter in meat for hens than in that used for people. These tables are worth studying. I look them over a great deal, and I am often surprised to find that one food has more building material than I ever thought, and another less. While we have not got to the stage where we are weighing our foods, I think it may come. We certainly cannot be as extravagant as we have been in the past. If we do not count the Phillipines, the United States is not growing larger, but the population is increasing, and therefore methods of economy must replace the wastefulness of the past when we had plenty of room and plenty of material.

FEEDING.

The food of the hen should include nitrogenous matter, or building material from which is made muscles, feathers, etc., and starchy matter, which produces heat, energy and fat. I sometimes illustrate the work of starchy matter by saying that one man will take fuel and burn it to run machinery, and another will store it up for future use. So some animals will store up starchy food as fat, and others will burn it all, converting it into heat and energy. Our hens also need some mineral matter for bones and fat for digester.

CEREALS.

I like to recommend bean meal because it is very cheap and very rich in building material. And it seems to digest as well as uncooked shorts or bran. For little chickens, of course, I bake a johnny cake out of bran, corn meal and middlings, and cook beans as for our own table. I should not expect a baby to eat what I could eat myself. I once knew of a woman who fed her little boy, three years of age, almost entirely upon beans. She thought that as they contained so much building material they would make him grow well. But instead he was very thin and weak. That strong food which would do for a working man would not do for a little child. So I give my chickens one meal a day of beans well cooked. For adult fowls I get the beans ground at any feed mill where corn is ground. It makes a very strong feed, and by itself is not properly balanced. My usual pudding, mixed stiff with boiling water, is one-third part each of bran, shorts and corn meal, by bulk, with a teacupful of bean meal or oil cake to four quarts of the meals. Shorts or middlings will ball in the stomach of the chicken, and bran is physicing, so I prefer a mixture of the two. Then I put in the corn meal because it is very easily digested. The oil in it makes it very bland. But I do not use a great deal of corn, because it is too fattening. A gentleman said to me, in one place, that he had raised 500 chickens this year, and fed them not much besides corn meal, and they had all lived. Certainly I am not talking against corn meal because it is indigestible. It is a very good feed to fatten cockerels, and if I were raising squabs or broilers, I should use very largely cracked corn. But the reason I do not feed it early to my chickens is that I want to stretch out my future layers. I can remember when my father raised his calves on corn meal. They were round and smooth and solid, but they did not stretch out, because corn meal does not contain enough building material.

### FAT AND BONE.

In speaking of oil cake, I mean that which comes from flax, because I am in a flax country, but your cottonseed meal has very nearly the same analysis. Green bone is a very valuable food but is not perfectly balanced. It can have so much marrow with it that it may possibly overheat. It used to be thought that we should not eat fat, but now we are taught to spread all the creamery butter we wish on our bread. If taken in proper quantities fat has its office in the animal economy, as a digester, but if taken in too liberal quantities it may heat or physic. I have a bone mill and believe in grinding green bones, as you get them in a shape that is something like fresh fruit compared with dry fruit, but I would not feed them too liberally. I once knew a man who fed green bones so constantly that his hens laid, and laid, and laid, and then, when they could not thus use up all of that building material they moulted right in the middle of winter, and I often say that it is just as extravagant for a hen to get a new dress when she does not need it as for a woman. If you buy the dry bone, it has usually had chemicals applied to it, as the gluing matter, etc., have been taken out, and if you will air it a little to let the smell of the chemicals out the hens will eat it better.

### GREEN FOOD.

I will call attention to the amount of mineral matter that certain substances contain. You have plenty of mineral matter in cereals, but in fruits, clover, grass and vegetables you have that form of lime which is more easily available by the system of the animal. I have some other arguments for feeding plenty of green matter. Green food is excellent to work upon the liver, and will keep bowels in a healthy condition; then, as a rule, the vegetables are cheaper than grain, and, last of all, if you feed plenty of green food you get an egg which will hatch in the spring. I have had inquiries in regard to poor hatches, and I could not find out that layers were overfed, or inbred. The only reason seemed to be the lack of green foods. And though I cannot explain what besides lime comes from vegetables, etc., I know there are some other substances that make hatchable eggs, or, at least, make fowls healthy enough to lay live eggs.

Ques. I find that my hens will take turnip tops better than any other form of green food. Are they as valuable as any?

Ans. The turnip ranks fairly well, but it is not the most valuable. The onion is really more valuable. Turnips would rank with carrots and beets, while onions and cabbages would precede. I make one-third of my winter feed vegetables. Cabbages I hang up, beets and squashes I split open, carrots I usually cook as my hens will eat them better cooked, onions I chop because they roll around so badly, and potatoes I cook. Potatoes are the only vegetable that there is any need of cooking, as some other flock of hens might like carrots without being boiled. The raw potato has a poison in its skin which some flocks cannot stand. I have known serious bowel troubles from feeding uncooked potato skins. I do not often speak of herbs, because farmers have not the time to gather them. If people are living in a village and keeping hens, such herbs as spearmint, horse radish dock, catnip, etc., are valuable. Of course they will not eat such pungent things alone, but if you chop herbs and put them in their puddings, your biddies think you are giving them a regular French salad.

### BILL OF FARE.

I find that I can save time by having a bill of fare for hens. No man in this audience would laugh at me as long and loudly as my father did when I first began to make out a bill of fare. I got a white pasteboard box and took the bottom or cover to print on, and put it up in the kitchen where I could see it, and then instead of trying to think what I fed yesterday and what I should feed to-day, I ran my eye over this bill of fare. Mine is a three days' rotation. I rarely have the same one for two years in succession, because I have not the same foods. My father would not use a bill of fare at first. From my experience with men I have learned not to argue with them. Let a man go right along and he will run his head against a wall. You will see as I proceed that I give the men credit for being profound thinkers. They will see farther into a subject than a woman, but she will get there first, as far as she is going. I did not say anything to my father, but when I was away in institute work I would leave with him over 100 carefully reared layers, and it never took him more than two weeks to stop their laying. So when I was going away at another time he very humbly said he wished I would leave a bill of fare. The idea is to have systematic feeding. You would be surprised to see how much better your fowls would do on it, and how much time you could save.

### PUDDING.

If I had been a man with no care for breakfast, and could have gone early to my flock, I might have fed pudding first. But I could send out a little warm grain to keep the hens along until I got there. When I have unthreshed grain I put it in as I lock hens up at night, and it is ready for them to begin on in the morning. In regard to pudding, there has been a great deal of controversy, especially in poultry papers. Some have said it should be fed in the morning, some at night, and some that it should not be fed at all, and they are all correct, in a certain sense. One summer I took over 300 temperatures of hens to know how they ran at different times, and found, just as I expected, that a hen's temperature is lower in the morning. She has fasted through the night, she has been in one position, and morning is the time when she needs coddling, if ever. So there is every reason to feed pudding then, if properly done. Some people have so fed pudding in the morning that hens gorged themselves and then they would loaf all day. For instance, a man will set out a pail of pudding and his strong birds get all they can eat and his weak ones get nothing. Our only hope is that these strong ones will eat so much and get so sick that they will be glad to resign in favor of the weak ones. My practice has been, in feeding pudding, to take a long board, four inches wide, and dab it its whole extent. You see no hen can possibly stretch herself that length. My biddies will often get it eaten while I am there. Then I scratch off the board, so that no crumbs will sour or be frozen on and wasted, and set it up in a corner. I prefer this arrangement to troughs.

### CHARCOAL.

Charcoal is most excellent for regulating the bowels of hens. It is very constipating. I would not feel that I could raise little chickens unless I had powdered charcoal if necessary, because I am sure to correct any relaxed bowels with this. I give it to adults once in about three days, I do not leave it before them all the time. It absorbs odors and would get filthy. I pound it up the size of corn kernels, and put out about what they will eat soon.

### AMOUNT OF FOOD.

Ques. How much would you feed hens?

Ans. Individuals differ, flocks differ, climates differ, work differs and situations differ. I can only give some general rules. Hens ought not to be hungry, any more than we ought to be hungry. And neither we nor the hens should be cloyed. We should feel every time we get through a meal that we shall want another some time, and the hen's appetite should always be sharp.

In a general way, I am trying to give one quart of solid matter a day to eight hens. In Illinois ten will eat this amount, in Canada, six. You must judge by watching your flock. And of course at different ages different amounts of food are required. The growing creature of any kind can be fed more in proportion than the adult, because the former is building himself. It is a law of animal development. The stomach of the young is larger in proportion to bodily weight than that of the adult. For instance, a boy has a larger stomach in proportion to his size than a man has. Watch quality of food for the young and watch quantity for the older ones. With the same food on which pullets will grow and lay and do well, old hens often get too fat. I do not like to have fowls of different ages in the same room. Again, I do not like to see so many crazy-quilt flocks. Perhaps you cannot pay high prices, but I would get a rooster of one breed, and every year secure another of same breed, and thus grade up, and in three years your flock would practically be full blooded, although you could not sell them for thoroughbreds. I was visiting a poultry plant yesterday, of about 700 fowls, and among them were many fowls which were well shaped and perfectly healthy, but a little off color, or something of that kind. I said to the owner, "You would sell these very reasonably to farmers, would you not?" And he said, "Certainly." Here is a good opportunity. You do not need high scorers unless you wish to be exhibitors.

Ques. In relation to chopped cabbage or onions, do you feed any special quantity?

Ans. Sometimes an objection is made to onions. I was talking with a truck farmer who said that when he did up packages of onions for market he was daily in the habit of throwing scullions and tops to his hens, and by and by his customers did complain of a taint. But it is only when there is excessive or successive feeding of onions that a taste will be perceptible in the eggs. The North Carolina Experiment Station fed onions for fifteen days before discovering any taint in their eggs. My practice has been to feed chopped onions twice a week, all the hens will eat up clean in an hour or two, and I have never had any complaint of the eggs being objectionable. The onion is the best liver medicine in the world. I was at a hotel not very long ago, and the landlady called me to see two fowls that she had bought. She wished to know whether I thought they were fit to eat. One of them had a very large, soft liver, and the other had a contracted liver so hard that we could really break it in two, and that fowl was dropsical. They both had liver complaint. The first one was in the early stage, but if the disease had kept on, she would have become like the second one. Where there is inflammation the liver later becomes hard. The owner had fed altogether too much grain, and especially, he had not fed any onions or other green food.

## STOMACHS OF HEN.

If we have not been acustomed to dressing fowls we do not always realize how many stomachs a hen has. First we have the crop, and if you remember, whenever you have dressed a fowl that had grain in the crop that grain usually was swollen and softened. I do not suppose you often get a chance to see that, because you have your fowls fast a few hours before killing, which is proper. But there is one instance when you might get this condition, and that is when the preacher comes along. I presume it is the custom in Maine as well as all over the world, to feed preachers poultry. I suppose the reason is that it is more digestible than beef and produces a milder theology. Then we have an enlargment of the esophagus just before the gizzard is reached, and you are familiar with all the latter's pockets. And in the bowels where the large and small intestines join you would find two bags opening into those intestines and making an S or triple appearance. If you should open those bags you might find bits of hull and woody fibre. They are to digest the woody fibre that other stomachs have not been able to operate on. A hen has really means of cooking her own food, which is what digestion largely is. We do not cook nearly as much for hens or for cows as we used. I am feeding some pudding because I am working my hens hard.

I know of one large poultry plant where the chickens are raised without a particle of cooked food. I raised my chickens this summer without cooked food and they were healthy, but I did not get as much growth as the preceding year. Puddings are easily digested and make rapid growth, but you must be skillful in your use. The hen must have grit in her gizzard and mica crystal grit is very sharp. I buy my grit because I have only fifty fowls now under my own supervision. If you have a large flock, in the autumn you will want to gather up gravel and put it up in boxes for next winter. It is to be taken with their meals, not left under snowdrifts. And you should be sure that the gravel is sharp. We have no gravel where I am, not even sharp sand, so I had to send a team eight miles, to an island in the Mississippi river. For three years I tried to get along without grit, but whenever I went without gravel up went the food bills. The next year I would have the gravel again and down would go the food bills. And when I did not have the grit my hens were not as well. After trying it for three years I had studied out the cause. In no stock on the farm is there any direct opening from stomachs into circulation. The food that is eaten has to be liquified, and it goes through very small pores in the walls of stomachs and intestines. If we chew our food well it will be more easily liquified. Gladstone once said that we should chew every mouthful twenty-five times. When the hens, therefore, had grit in their gizzards to grind their food, the latter would be liquified, and go into the circulation and produce results, but when they did not have the gravel, probably a large amount of food went through the system undigested. Of course I did not have the chemical appliances to examine the faeces, but at the Minnesota Agricultural Experiment Station some of that work has been done, and it has been found that many times food has passed unused through animals. I have preached in the West for a long time the necessity of grit in the gizzard, and we are doing better. I know you have the reputation of being economical, but possibly it is a good thing to reinforce your economy.

### SLOPPY FOOD.

We see the hen has four stomachs, and I think the Lord would never have given an animal four stomachs to pour slops through. We have, with humility, to acknowledge that the pig has a simple stomach more like man's than is that of any other animal. We and the pigs can take slops, but fowls should never be fed sloppy food. Even the bread and milk that I give chicks is never sloppy but only moist. I know of nothing that has so much arrested the spread of chicken cholera as the fact that people are getting over this idea of giving sloppy foods, and giving more bulk and variety.

PERCHES.

The one idea I want to give you is that hen house furniture should be moveable. It does not make any difference what the design of the nest box or perch is; I shall say little about the style, but I try to get at some principles. The simpler the perch the better, as it will be easily cleaned, and the fowls will not then be devoured by mites and lice. I have a couple of saw horses for supports. And I use leather loops made out of old harnesses for securing the perches to those horses. I like to have doors all fastened back, if only by a strip of leather with a hole in the middle to go over a nail. It is a great thing not to have slamming, and not to have the heads of chickens smashed. I have handles on my coops, made of the old harness also. To keep the lice and mites off, I pull out perches and turn the saw horses bottom side up and get kerosene into all the bearings. I notice that a great many use whitewash, but I prefer to save the whitewash for walls, and use kerosene for furniture, on account of my clothes. I used to have all such articles nailed down tight, but in order to clean them thoroughly I had to take a rag tied on to a stick or an old paint brush and get down under my perches, etc. It was very tiresome, and more of the kerosene ran down my arm than on the perches, so I concluded that I would have everything moveable. I have rather wide perches. I tried the experiment in two of my hen houses, for some years, of having wide perches and narrow perches combined, to see which the hens would prefer, and in every case they liked the wide roosts better. Leghorns and Bantams will do well enough on little poles, but the heavy breeds which we have been developing, as Brahmas, Plymouth Rocks and Wyandottes, are very different from wild birds. I presume many of you have seen specimens of the wild fowls of India. They are very much lighter than the domesticated breeds, just as the little Kerry cow of Ireland is very different from the big Durham or Holstein, or the Percheron horse from the native stock. I find that many of the experiment stations use 2x4 lumber, the broad side up. We always have plenty of boards, and they do not warp to do any harm, so we have used them, but if we were to buy new, we should get the 2x4.

Ques. How far apart do you put them?

Ans. Usually about eighteen inches. That would depend on the size of the fowls. The height is more important. Leghorns can take a very high perch, but the heavier fowls do not ordinarily like to go more than two and one-half feet from the ground, and oftentimes two feet is better. If you have the perches a little higher than the nest boxes, fowls probably will not sit in the latter. It is fully as well to have nest boxes on the ground for the large breeds as they rarely eat eggs. It is those little, skipping, hopping ones which cannot get enough to do without doing mischief, that eat eggs. They can fly up, so you can have their nests high, and eggs not so in evidence. I have never had to darken nests to keep hens from eating eggs, but I have had to put my nest boxes up so that Leghorns could not constantly see the eggs. I would have the perches level. If they are ascending you can look at your fowls better, but they will crowd to the top. Like politicians, they all want the highest seat.

## NEST-BOXES.

My nest-boxes are made of one-half inch stuff. I have practiced buying dry goods boxes, or soap and cracker boxes of the merchants, as I want nest-boxes light enough for a woman to handle, and the inch stuff that is usually found at lumber yards, is too heavy. But it is necessary to speak for the boxes in advance. Get them deep enough. I like a pretty generous nest, about fourteen inches square, and even larger. I find that I have fewer broken eggs than when I have smaller nests. These boxes are hung to the wall. They have a top, bottom and sides, and a cleat to hold in filling with only the rest of face exposed. I did not know any better way than to hang them with hooks and eyes. One day a man came along and said, "Pretty good nest boxes, but why don't you drive two strong, steel nails into the wall and pass their heads through holes in the boxes?" They were cheaper and did not wabble. It was a great improvement.

Another improvement was suggested to me by a man. I had some little coops with floors, as I live in a damp state, and thought it would be better to have floors, to prevent rheumatism, and also to keep out rats and skunks. One day a man came along and said, "Pretty good arrangement, but what makes you have the floor nailed? Why don't you have it run in and out on two little cleats?" Poultry culture is a business which requires about as much ingenuity as any. That is the key note. Save yourself steps, save yourself labor in every way you can, and you will find the pursuit a pleasure. There is another arrangement that has been very helpful, and it is nothing more or less than a board, with leather hinges, that shuts down over the nests. This can be closed at night and prevents hens from sitting in the nests. They will sometimes do this, and it is a hint of one or two things; either that your hen house is cold and you should make it warmer, or else you are giving them such narrow perches that they are not comfortable. You will not have so many crooked breast bones if you have wide perches. I would go to my hens four times a day, and try to systematize the work. Of course I have to go in the morning to see that the nest boxes are open, that there is plenty of water, and the operations of the day are ready to begin. Then I go at 11 o'clock and gather the eggs, as I do not like the eggs to freeze in winter nor heat in summer. Then there is another reason. Hens are like women. There are certain nests that are fashionable and you will see two or three hens waiting to lay in a particular spot. If you leave these eggs ungathered all day long, they are successively cooled and heated. And 11 o'clock is the time for fresh water. Then at 3 or 4 o'clock I gather the eggs again, and that is the time for more fresh water and for supper. Then I go out at night to empty dishes, lock up and see that windows and drafts are arranged all right. I am careful to open nests in the morning, and to shut them at 3 o'clock; then I have got ahead of the hens. That saves an immense amount of work in refilling the nests. For the nest filling I use sawdust a great deal, and sometimes lawn clippings and other material. Sawdust is very odorous, and can be shaped very readily.

Ques. Do not your hens ever lay after 3 o'clock?

Ans. In some rare cases. I would go out to shut the nests later than three rather than earlier. But I have rarely found an egg laid upon the ground. I attach a good deal of importance to closing up the nests, because the eggs should be kept as clean as possible. I have talked with a good many merchants, and they all prefer that eggs should not be washed. Of course it is better to wash an egg than to have it covered with dirt, but an egg that never has to be washed is better, and will keep longer. The washing is done miserably sometimes. A little cold water will be used, and the dirt will simply be spread over the surface more thinly so it will not show as much. A dirty egg should be washed in plenty of warm water, and wiped with a clean cloth.

### WATER DISHES.

It is all right to use the fountains that can be bought, but there is expense about a lamp, there is work, there is danger, and there is an odor. We are no longer trying to get hot water, but we do not like to have the hens drink ice water; we like the chill taken off so they will drink abundantly, because a great deal of water is required in the production of eggs, and so they will not have to raise that water to the temperature of the body. When winter comes I put a couple of bricks in the warming oven, and when I go out in the morning a hot brick is taken, and when I go out again at 11 o'clock another is taken out and the cold one returned. The brick is placed under the drinking pan, and a ring of a keg that has no bottom is placed around it, to keep the hens from getting their feet on the hot brick. We have used that for some time, and one or two large poultry plants have adopted it.

### INCUBATORS AND BROODERS.

It is well always, if you intend to use an incubator or brooder in the dwelling cellar to consult your insurance agent. Many companies will not permit an incubator to be run in the cellar of a dwelling house. I think it is safer and better to have a little cellar at one side. I have tried to run a brooder out of doors, but I think the most of them would be run far more successfully in a little brooder house. I like to put paper in the bottom of brooder and sand on top of paper, and then I can clean by lifting the paper out. I remember how I used to burn my fingers, and the paper would flap in the wind, and I was very glad to have some shelter. A little brooder house pays for itself many times over. I have known people to run brooders in cellars, but they had sore-eyed chicks. In regard to incubators, I take a conservative ground. I will say that there are people who need them. If you have fancy fowls you cannot afford to have them sitting.

If you are in a village, and attempt to have many hens sit, your fowls and your feelings will get dreadfully mixed with your neighbors'. And if you are to have a large number of broilers, you will need an incubator. I stopped at the New York Experiment Station to learn if their views are the same as when I spoke there two years ago. The poultry professor takes the same conservative ground. He says he would be very careful about advising the average country woman, raising from 200 to 500 chickens, to buy an incubator. Mr. Rankin, who invented a very good machine, the Monarch, says that a person running an incubator should have a day sixteen hours long. At this very New York Experiment Station they showed me the near-by bedroom where the man sleeps when incubators are being run. The farmer's wife needs first of all a good hen house that she will use 365 days in the year, and she could probably get up a hen house for the price at which she could buy an incubator and brooder. In the West it costs about twenty-five cents per square foot of ground space, but in the East you can probably build for less than that.

## SHELTER.

I first had no scratching sheds, but I learned that they are just as valuable as the poultry houses. The first sheds I had were nothing but forked sticks driven into the ground, with corn stalks and straw put upon them. I discovered how much better the hens were laying, and I later got lumber and built better scratching sheds. If you have a house that is large enough for the hens to exercise in during the day it is too bleak at night; and if you reverse matters and have a house small and snug enough for night, you have not room enough in the daytime. We are on a farm where there is a shed eighty feet long for steers, and other buildings, so the hens have many places to visit. But if living in a village place, I should be very careful about letting them out. They should have plenty of air and sunshine, but I would not let them out any day that I could not enjoy being out myself. It is no advantage for any stock to race about in the snow or storms. There is a difference of opinion on this matter, however. Many shut their cows in all winter. I tried shutting my hens in one winter and they laid uncommonly well the first of the season, but before the winter was over I had more sickness than I have ever had, before or since. My first houses were single boarded. But I discovered that they were not warm enough. The frost was getting through, and the food was going into making heat and not into making eggs. So I used to bank the houses. You can bank with straw, and bank up to the eaves, but all that makes a great deal of work. So as soon as I could, I got them all double walls. Two of them were lined with sawdust. I had occasion to remove the sawdust in one to repair it, and I discovered that there was dry rot in the timbers. I also discovered that sawdust was a good harbor for insects. That is the objection to it. It is a very good absorbent and it makes a very dry, warm house. The last hen house I built I liked very much indeed. It has paper crinkled, between the studdings. I built another and put in two thicknesses of plain paper, but I could not see that they were any more efficient than the crinkled paper. Crinkled paper divides each little air chamber between the studdings, into three parts. If we have a large air chamber and get a circulation of air, it is not as efficient. Air is as poor a conductor as we can get, and we are doing the best we can to put it in between the walls, because it will not convey the heat away as quickly, even, as boards, but if the air is circulating it will do more damage of that kind, and a division of air spaces is always excellent. There is also an advantage along this line in using small timbers; 2x2 will answer unless you have a very heavy structure. If I were to build again I should follow the outlines of the rafters and get a small air chamber overhead, instead of a large loft.

### SUNSHINE.

I had a very interesting experience on the value of sunshine. There have been some just as interesting ones at the Experiment Stations, but not in such definite figures. The Iowa Experiment Station found that cows standing nearest the light gave a better flow of milk and had the best health. Two of my hen houses were built somewhat near together, and at the time they were built our storage tank was sunken somewhat in the ground. We have an open windmill tower, and neither shaded the houses. The water is carried under ground to stock in two different places. My father and a tenant tried two different tank heaters, but did not like either one. I presume there are good ones. The one that was built into our tank was a very expensive one, but water around it did not make a good draft and creosote resulted. So father concluded he would build a house over the storage tank. This has worked all right as far as the tank is concerned, but one of the hen houses gets the shade in the morning, from sunrise until 9 o'clock, and the other house gets the shade from 3 o'clock in the afternoon until sunset. So I saw a chance to learn the value of sunshine. I would take out my thermometer at noon and examine the two houses. They were so nearly alike in their construction that I very rarely found more than one degree of difference at that time. But when I went out at 9 o'clock and took the temperature of the sunny and of the shady one, I found that the sunny house was then from seven to twelve degrees warmer than the other. And I would find a similar result in the afternoon. Here is a great lesson. Do not obstruct the south exposure of the hen house. Be sure to let the blessed sunshine fall upon the south side. There is just so much heat being supplied, and it is not costing anything. It might be a good idea to open the blinds of houses more. I know that carpets will fade, but if the roses in our carpets come into our cheeks it will be all right.

### PARASITES.

Lice and mites vary in color, size and shape. I did not suppose I would have any opportunity to speak about mites in the East because they began in the West, but to my surprise I find they the quite thick in Maine. I am prepared to say positively that the lice on hens do not breed on cattle and horses. They will run over cattle and horses, but they do not lay their nits on them. The mites are different. They will feed on cattle and horses also. Mites live in the nest boxes and perches, and go out at night to do their feeding. And you may find them on sick fowls and sitting fowls daytimes. The remedy for lice is comparatively simple. Have a good dust box. If you are exhibitors do not use ashes, but if you are not you can use them. Get a coarse sieve or a window screen and sift the dust, and you get such a fine bath that they will pretty nearly take care of themselves. Or you can use a puff box. It costs only twenty or twenty-five cents, and is a valuable thing to have. An arrangement for dusting hens consists of a board with a loop through it weighted by iron, which loop fastens the legs of hens so that you can use both hands to dust them. A man saw that arrangement and said, "That is a pretty good thing. Guess I will have the same arrangement." And he took an old wooden chair and fixed it with two holes and a loop, etc., then he took another chair and sat right down beside the hen and dusted her thus. Wasn't that easy? The fight against lice is not nearly so serious as against mites. Do not delay to exterminate the latter, if you have any. If you use whitewash you should buy the lime unslacked. Use very strong, hot, thin whitewash, and put into it carbolic acid or sulphur. If you use salt and plenty of it, it is all right, but it should be used alone. If you have not used whitewash and have a new surface of board, there is a substance which is very effectual for mites, which is called carbolineum avenarius. It is a dead oil of creosote and is very penetrating. I want to say to the gentlemen that it is a great fashion in the West to whitewash stables. We find it is the only sure preventive of calf cholera. You might practice on your wife's hen house.

### LAYING SHAPE.

I want capacity always in the hen. I want length of body or depth of body. The hen makes her eggs from food, but there are certain places where you do not like to have her store her food. She has two places to put her fat, on top of her tail and down under her tail. I do not like to have my hen broad near the tail. I want her broad through the huckle, and triangular in body. You can pick out that shape in any breed. I should at once dispose of any hen that began to bag down behind, as that is almost a clear deposit of fat. The only use of it is to try it out and use to prevent the scale insects on her legs. You should not set hens with rough legs, and such a fowl is not fit to eat if it has had that trouble long. If it is in the early stages you can scrub her legs with a tooth brush, and put on her own oil, with some kerosene in it. But kerosene must not be used clear, as it is too severe. The main thing for a farmer is to learn the laying shape, the appearance of health, and the correct type of the fowl he is dealing with. He should know by the brightness of the eye, the pliability of the comb, whether the hen is in good condition. I will close by mention of a young man who applied for admission to West Point. It was in the days when the medical examination came first. He passed that very creditably, and supposed he would get the appointment, but when the surgeon gave him his physical examination he was refused for this reason: The surgeon said, "You have not stomach enough. You cannot eat and digest food enough for a soldier's life." Great workers are great feeders all over the world, hens as well as men.

## AGRICULTURE IN PUBLIC SCHOOLS.

By Mrs. IDA E. TILSON, Salem, Wis.

Harvard's brilliant president, Edward Everett, concluded a speech delivered in 1837 by saying that next to eternal things the people of the United States showed most interest in education. Did he live now, he might not make his exception, if we may trust General O. O. Howard, who recently, before a Presbyterian assembly declared we have no more theological sermons, ministers, themselves, being occupied with the practical details of this life of doing. If we do not lose sight of Heaven entirely, the best possible preparation for it is to live aright the life that now is. I take pleasure in presenting a department of education that certainly has much to do with our material welfare, and yet, perhaps more than any other department, will lead through Nature to Nature's God. God is behind all statistics, but agriculture is a more direct path to Him than arithmetic is. His own creations speak louder than the devices of man. Where do poets, artists and novelists go for examples of sin, sadness and despair? To the city. Where do they go for examples of innocence, purity and comfort? To the country. The exceptions are so few as to prove the rule. And yet, according to the last census, the urban or city population is gaining by a much more rapid per cent than our country population is. What is the explanation? Older people have theorized about the farm, but have not taught the young its beauties. Artists and writers are mature, the great human tide setting toward the city consists of boys who would rather be clerks than farmers, and of girls who would be milliners rather than their mothers' assistants. The city boy, his wits and tongue sharpened by contact with many people, can talk volubly about entertainments, shop windows and policemen, while his untutored country cousin is dumb, amid greater wonders. I had various city cousins visit me when a child. I did not mind their prettier clothes a whit, but their curled hair and big stories did aggravate me. Unlike most farm children, I was irrepressible and dogged. I was considered, even by the country children, a wonderful jumper, being able to jump from the highest beam of the barn into the bay, whether very full of hay or not. I could ride farm horses bare back. These things I did before my city visitors, and filled them with fearful longings. The argument is,—know your ground and you will be content, proud and even eloquent.

There are two results hoped for from agricultural education. We wish to keep more boys in the country, and even bring some from the city. We hope to educate for the farm, not away from it. Because, according to the researches of Arthur McDonald for the Journal of Sociology, while city children are more vivacious, country children have more endurance, and after five years of age country children are taller and weigh more, and the researches of a number of scientists in the cities of United States, France and Russia, show a general correspondence between brain power and weight of children. The country is a good place to grow bodies and brains in, as well as cabbages.

The first objection met from teachers is that this is a fad, which, like other fads, will soon pass by. The statement has often been published that every state and territory in the Union but two, have agricultural experiment stations, and many of them are associated with a course of study, constituting full fledged agricultural colleges. These have been established at public expense, and mean a large investment of money. They cannot continue their work unless fresh material, in the shape of new students, comes to them from the primary schools. Their influence is for this new topic. Though the New York Farmers' Institute claims the honor of introducing Nature Study into New York public schools, Cornell Agricultural College has furnished teachers their working material. The agriculturist of Minnesota Agricultural College was chiefly instrumental in getting the Minnesota legislature to pass an appropriation for leaflets from that college, as a beginning of the work in public schools. Agricultural and horticultural societies and farm institutes, all State institutions, favor this new topic in education. Arbor Day itself, is agricultural education. The United States farm press, though not subsidized, is probably the ablest in the world. Itself an educator, it welcomes the day of more intelligent readers. Agricultural education is a species of that industrial training still more widely known, and is in harmony with the spirit of the age.

As one straw to show which way the educational wind blows I will simply mention that when the Chicago merchants, about two years ago, complained they got no students from the public schools, to serve them as clerks, who could properly write and spell an English letter, and some more abstruse studies were cleared from the curriculum, nature study was left on.

The objection that teachers, books and charts are not ready is met by the simple assertion that a demand invariably secures its supply. Though I have had largely to work out my own scientific education, because I was drilled more in Latin than on botany or physics, I shall venture to outline a few suggestive exercises, such as I used years ago in my own schools. It will be seen they did not add to my hours of labor, but gave us many apparent outings, though these outings were fraught with knowledge and potent in results.

The lady county superintendent of schools who sent me word she wished I would stop talking this subject because there would be nothing a young woman could teach about farming, will notice I deal more with the science than art, just what a trained mind could take up easier than the farmer's. She teaches the science of numbers, and he applies it to footing up his bushels of potatoes and wheat, to measuring his cistern and wood pile. A very brilliant scientific lecturer to farmers always starts by saying: "Farmers don't ask me how to plow, because I never held a handle, but I have studied the composition of soil."

That agricultural training is needed was proved when a scientist examined Boston school children, only to find that a large percentage did not know lumber came from trees, nor milk from cows. An eminent teacher of cookery did not know what wheat was when showed her. Many parents have not the trained minds for any kind of teaching, and others are too busy with their own pursuits. Agricultural education, properly conducted, does prove attractive. Over ninety per cent of the agricultural graduates of Minnesota are in some kind of farm business, fewer backsliders than the churches show. Little Oklahoma's young agricultural college furnishes almost as good a report.

I will first make the usual distinction between methods and devices. A method is a general plan by which anything is attained, like the alphabetic and word systems of learning to read. A device is an assistant to a method. My three methods of teaching agriculture or useful nature study are seeing, working, talking, though they run into each other, and the classification is not definite, because somebody will do better when we have a little more time.

Children learn a great deal by mere absorption. Instead of the walls being entirely covered with spelling charts and maps I would add such as the University of New York, at Albany, can furnish, of our destructive and friendly insects. Travelers tell me charts of the friendly and injurious birds are hung in every French schoolroom, and that lists on guide boards are seen in many parts of Great Britain. Fauvre says if the indiscriminate slaughter of insect-eating birds is not stopped, our children will be crying for bread in fifty years. Prof. Hayes of Minneapolis is preparing charts of grains, showing infloresence under microscope, structure, stages and habits of growth. I am personally acquainted with two farmers' clubs, that, at set times, visit from farm to farm, to see whatever the respective farmer has to show in the way of worthy stock, fruits, crops or machinery. If there is an intelligent farmer and tidy farm near the schoolhouse, let the teacher ask his permission to go there some afternoon, and with her pupils be escorted around. Then ask the children to write essays on their inspection, and draw plans of the farm and fields, locating the buildings. By the aid of a farmer's ten feet pole, or even a long tape line, or a bicycle cyclometer, a very accurate map of the country around a schoolhouse, say taking a radius of one-half of a mile or a mile, may be made, in time. The agricultural students of Cornell have done so for that institution, the idea being not only to indicate hills and streams, but farms, and where any interesting soils, weeds, flowers, etc. could be found. Each succeeding class has the pleasure of verifying this map, a delightful scheme, on a less elaborate plan, for the little country school.

Under the head of agricultural work, I would suggest three kinds of gardens, experimental, competitive and rotatory. The competitive, giving each child an equal plot and similar seeds, and comparing results, has been tried till familiar. There is at least one rotatory garden in Minnesota, a neighboring farmer having kindly loaned the use of a little corner of his farm. On one part of the plot, the same thing is raised over and over. On the other is maintained a shift, showing by its better yield that a sameness in crops will exhaust some certain element or elements of plant food. I get this information from the State Horticultural Society's proceedings. Prof. Hayes in the Minnesota Horticultural Magazine, July, 1901, lays out several such rotations. He finds the grown agricultural students coming to him do not like rotation of crops at first, because unused to the idea. Of course, this plan cannot be carried out with a frequent change of teachers, but let us hail anything which, aside from its own merits, helps secure the permanence of good instructors.

I have talked with several Hampton, Va. students on the experimental work there. A variety of seeds are planted all at the same depth. Some come up readily, some with great difficulty, and others are lost entirely. Similar seeds are put into different soils, that the effect of sand, clay or humus may be seen, and the soils in the neighborhood are washed and sifted to discover the proportion of sand, etc.,—what the experiment station does more elaborately and perfectly with chemical analysis and fertilizers. Weedy, unsorted seed packages are used, also old, dead seeds, and results noted. One of the most frequent answers I make through papers, to poultry raisers, is in relation to buying screenings of wheat. I tell them to pick over an ounce of screenings. If it is half weed seeds, and is sixty cents a bushel, they are paying two cents a pound for the wheat part. Now what is clear wheat a pound? Often cheaper, because mustard and foxtail seeds must be cooked to be eaten by fowls and are bad seeds to spread in the land. I wish the number of my letters could be reduced by western teachers drilling their pupils on purity of seeds and grain, and the true versus face value of mixed lots. Let children see water follow up the threads of a towel by capillary attraction. Tell them it will climb up solid soil in the same way, but if the surface is pulverized, the connection is broken and water escape stopped. Two plots, one with surface stirred, and the other not, can be examined after a few days of hot weather. Moisture will be found around roots just below the dust blanket, while the solid earth of the other plot is dry to a great depth. This surface stirring will save crops in any but sections so dry there is no water at any depth.

Beautifying the grounds of a school gives agricultural education. I would not hurry too much, but have the children draw plans and discuss where the trees would give most shade and pleasure, and be least in the way. I would also leave something for future teachers to do. Our West Salem school yard has what every such yard should have, a clear ball ground at one side or behind. But our trees are in front of the building and rapidly obscuring it. I would prefer a semi-circle, behind and at the sides, as a tasty background and to afford, with shrubs and vines, a covering to the necessary outbuildings. If almost indelicate to mention the latter, consider the effect on hundreds of impressionable children who see around the schools they attend, no provision for privacy and refinement. There might be an occasional tree in the front yard, to shade some rustic seat. That would be the place for flowers, and a box at one side to hold all bits of paper, etc., that might be picked up. We have donated to friends several woven of thin strips of wood, in which our bee supplies come. A wit has said: "There are only two causes of trouble in the world,—men and women." I would have three participators in improvement, men, women and children. I think the wit forgot the children. Let their's be the chief part. Principal John J. Somers of the 10th district school, Milwaukee, was told when he set some trees that they would soon be ruined. No boxes were put around them, but the children were talked to, how they should guard and protect those trees from injury. Every tree grew. Not one died from the carelessness of the children. Now let the women attend school meetings and see there are hitching posts, and horses are tied to them instead of to trees. Some intelligent farmer may need be drafted to teach the setting of trees, and that the tops should be trimmed in proportion to roots secured, that evergreens absolutely must and other trees better be covered with a wet cloth during removal, as the sap, especially if resinous, dries hard in a short time, if exposed, and forever prevents roots starting. The soil in hole should be well pulverized for roots, and firmed under trunk. Grafting and budding are not difficult to learn and teach. Funds can be secured through regular appropriation, if the women get out to school meetings. Subscriptions and entertainments can also assist.

If there are woodlands near, walk, rejoice and worship in these, the first temples. Teach children trees are natural lightening rods, and not to stand under one in a summer storm. While they may not cause rain, they have much to do with its conservation and distribution. The following questions might be useful:

1. What do leaves, roots, etc., do with rain? Is it entangled or does it run off.

2. Where does land dry out quicker, under or away from trees?

3. Did you ever see a gully? What made it? Gullies are worse in south because stubble of cotton and tobacco does not hold back water like our oat and wheat stubble.

4. Leaves in my hand and in a vase of water would show a great difference. What do trees pump up from below and give out through their stomata, or breathing pores in the leaves? They also give out oxygen in the sunlight, and absorb carbonic acid. It is claimed this is reversed at night, but the proportion of oxygen given off, as it is done in their active time, is much greater than that of the carbonic gas.

5. What else do trees pump up, and put on the ground in the falling leaves?

6. What destroys trees? Fire, use and storms. As, according to Gifford Pinchot, $50,000,000 worth of timber is burned every year, President Roosevelt says the greatest internal question is how to preserve and enlarge our forests. Cripple Creek mines take 25,000,000 feet a year for supports. Comstock and others have shut down for lack of timbers. With the mountains unclothed, streams run off too rapidly for the steady uses of irrigation. An effort is being made to keep the browsing herds

from the remaining forests, where they do injury to young growths. Miners, farmers, ranchmen, and many classes are thus affected by the forestry question. If my pupils, in their reading, learned about Spanish bull fights and the compressed feet of Chinese women, well and good. I should take no time to teach such things, but, instead, point to the fact that the decadence, the floods and poverty of both those countries began with their being almost totally stripped of trees. I should ask for essays on useful barks and leaves.

Prof. Albert of Bloomsburg Normal, Penn., a specialist in geography, was appealed to by a city that thought it was using too diffuse and expensive a geographical text-book. He wrote the publishers to specify their best pages and features. They designated some twenty-six pages out of over 100. While we should memorize enough about the chief countries and cities, that we need not consult a geography every time we read a newspaper, the main idea in teaching geography, as pushed by Columbia University, N. Y. City, and set forth in a treatise by one of her professors, Prof. Butler, is to show the effect of environment on pursuits. An illustration of this can be given in agricultural teaching. To this day farm institutes of the west fear to have an eastern horticultural speaker, because in the damp, cloudy atmosphere of New England tree heads need thinning out to admit circulation of air, while in the dry, sunny, burning air of the western prairies the thicker the head the better, because each part shades and protects every other part. In Florida there is both moisture and heat. When I lived there, the practice was to trim orange trees in the shape of a hollow globe, thus securing a combination of shade and air.

Another set of questions might be as follows:

1. After a flood or great rain, what do we find in the low spots after the water has subsided? Are the hills, therefore, becoming lower or higher? Soil is being transferred from their inaccessible or difficult tops. What was the effect on the pebbles of grinding them together in the torrent? Travelers tell me the face of the Egyptian Sphinx is almost obliterated? By what, in a rainless region? In the western United States wind laden with dust is thus polishing off the rocks and hills, and making more soil. Are God's natural laws slow or swift in operation? Is He

patient? Thus, without saying much about eternal matters, I can incidentally, to use my own expression, project the child's thoughts into eternity.

2. If water gets into cracks of rocks and freezes there, what is the effect upon those rocks?

3. Mosses and lichens growing on rocks disintegrate them with their minute, thread-like rootlets. Is it wise, then, as often seen, to let lichens grow on fruit trees? On which side of a tree do lichens grow? Is this always true, so you could thus always find your way north by them?

I should tell the children about T. B. Terry of Hudson, Ohio, who, after the first six years he was learning the business of farming, never failed to lay up $1,000 a year on a farm of fifty-four acres, and of the late John Smith, Green Bay, Wis., president of Wisconsin Horticultural Society, whose gross proceeds from a garden farm of forty acres were sometimes $7,000 a year. These results were obtained by thorough cultivation. I have heard Mr. Terry and Mr. Smith say that even when they were digging potatoes in one part of the field, the cultivation was still going on in the undisturbed parts. The potash, lime, acids, etc., in the ground are acting upon, dissolving each other, and thus liberating plant food. When particles have remained long together, they have modified each other all they can. New relations will bring new action. Did you ever see the garden of the human heart wrought upon by new society, new demands and new motives?

When land is left bare to rest it, or is bare after a crop, innumerable weeds spring up. Many people have let them grow, because they shade the ground and prevent its drying out. Now, farmers have learned to put in rape, or some other late growth, which shades, and plows under as well, while giving better pasturage than weeds, and not filling the land with noxious seeds. Prof. Shaw of Minnesota Agricultural College, in a practical work on weeds has pointed out what is seldom mentioned in botany, that you will best know how to fight them if you understand their habits of growth. He says the perennial weeds, like trees and shrubs, generally have long roots, spreading in different directions. They are well anchored. They draw on a large territory and are prepared to stay. The biennials have a tuberous root in which is stored material for the second and main year, while annuals, which must get their nourishment quickly, have a thick mat of shorter roots. I have been looking for exceptions, and so far have met only the ordinary grasses, which have roots something like annuals, so they may grow thickly. What a vista this opens up to the observation of a child.

In Minnesota public schools a little book on mythology is read to or by the children in the intermediate grade for the purpose of cultivating the imagination. Let us leave those rather immoral gods and goddesses, some of whom would not be admitted to modern pure society, and cultivate imagination by studying the origin of names in nature. Rye is rug in Danish and from the same Anglo-Saxon root is rugged. Is it not a hardy grain? Wheat is from the same Anglo-Saxon root as white, in reference to the color of its flour. The so called Irish potato and the tomato are, you know, both of American origin, and quite closely related. The names are likewise thought to be of Indian origin. The Senecio, a little common clustered flower related to the sunflowers, is so called from Senex, Latin for an old man, because its petals soon drop, leaving a comparatively large, hard, bald center. Aster, with pointed petals, is from astra, Latin, you know, for star. I wondered as a child how any one could think the foxglove looked like a glove. It is a corruption of the old Anglo-Saxon glew, bell, and a bell the flower is. Columbine is from columba, a dove, and its scientific name, aquilegia, is from the Latin aquila, an eagle. Does it not look like doves around a dish, or the Roman eagles around their standard? Cranebill has a seed with a long projection or awn. Its aristocratic cousin, the geranium, has something the same seed, and gets its name from the Greek geranos, a crane. This awn expands and contracts, according to moisture present, screwing to the left when dry and to the right when moist, but never digging itself a hole and seed bed. Some flowers have little combs to card from the visiting bees pollen fallen on them in other flowers. Some have a sticky surface to catch it. The children who study these things may make the future wheat and corn breeders.

The helpful toad and the pestilent mosquito are easily studied in their various transformations. That there was not a case of yellow fever in Havana the summer of 1901, first exemption in a century, it is said, shows what a study of mosquitoes, drainage, etc., has accomplished. The spider, too, is everywhere, and some scientists rank him near the birds, as a destroyer of harmful insects. They are rarely poisonous, and I never allow one killed.

Many teachers read aloud to their pupils. Instead of stories, I would suggest that new book on the horse, by Dr. Curryer, assistant superintendent of Minnesota Institutes. Good judges have wished it was in every schoolroom, as it is a regular kindergarten system for horses. Prof. Hayes of the same state is preparing an agricultural reader. I once used a zoological reader in a Mississippi school, and know how much the children thus learn about animals.

The circulating library and the central school will powerfully aid agricultural teaching, the former by furnishing helps to both teachers and pupils, and the latter by providing instructors for special departments, instead of one poor maid-of-all-work in the schoolroom. Each Wisconsin district is encouraged to provide by entertainment, subscription or tax, a permanent library of books of reference. In addition there is the state library, divided into sections, each of which stays a few months, then passes to another school, and is replaced. Minnesota has passed a law permitting and encouraging the union of several districts in one central school. Illinois has been the pioneer of this. It gives teachers a chance to fit themselves specially for intermediate, or grammar or primary work. It gives pupils the stimulus and competition of numbers. The children are gathered up by drivers, to whom routes are let, something as to cream carriers. The contractor for the children is under bonds to have a safe team, to provide robes in winter, and to use no improper language before the children, and is fined when he delivers his load late. Country roads are so drifted in winter, many more children can thus attend regularly than by the old method of walking a shorter distance. The social features of the drive and school will do much to relieve the bashfulness of country children.

A lady who heard me speak of this wrote me that in parts of France, the children in turn bring and prepare vegetables, the district provides a bit of meat for soup, and lessons are punctuated by the bubbling of the kettle as the warm dinner gets under way. Is it too much to hope that when the central school becomes general, some one living near will take the contract of furnishing warm dinners, instead of the cheerless lunch? Or, far better, cannot we then have, among our staff, one instructor who can teach by demonstration that plain, hygienic cooking which is so allied to agriculture, because it, too, must study the nature of foods? While cookery cannot proceed on wholesome lines unless it includes a knowledge of the production and elements of food, good food goes farther. It helps drive away alcohol. It has been said some men put the devil of strong drink into them to drive out the devil of indigestion.

The same lady wrote me of a country school with a Gypsy queen festival, a May queen crowning, and other simple plays enacted out-of-doors, having the natural setting somewhat on the order of our college campus representations of "As You Like It," or "Midsummer Night's Dream."

At least let every district or teacher own a good microscope and field glass. They will be more useful than a tellurion. A clerk, according to a newspaper story, was endeavoring to pass a civil service examination. Asked how many miles away the sun is, he said he did not know, but was sure 'twas not near enough to interfere with his duties. These topics I have tried to suggest are very near. "The word is nigh thee, even in thine own mouth."

# REPORT OF PROCEEDINGS

OF

# STATE DAIRY MEETING,

## Held at Bangor, December 3 and 4, 1901.

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### ADDRESS OF WELCOME.

By Alderman E. C. DONWORTH.

The unexpected absence of Mayor Chapin makes it necessary that the honor of addressing you fall upon one of his council, and, ladies and gentlemen, it is an honor to address the members of this board, representing, as they do, the oldest, the most important, and perhaps the only independent profession. It is an honor to the city of Bangor that you are here to-day, because it is a virtual recognition that this section of the State takes a great interest in the affairs of your association, and that it is ready and willing to bear the burdens which are incident to the carrying on of your organization. The eastern section of Maine, and more particularly Aroostook and Penobscot counties, while they seem to have their attention mostly taken up with lumbering, yet take a vital interest in the affairs of agriculture. Bangor, lying as it does in the lap of Penobscot county, and being blessed with the presence of so many dairymen, so many farmers, takes a great interest in the Maine Board of Agriculture. Not only do the people at large take an interest in you, but they also by their representatives in Augusta, have taken measures to protect your interests. To that end there are upon our statute books provisions for the protection of the manufacture and sale of milk, butter and cheese. It is only by the rigid enforcement of these laws, and by the intelligent co-operation of the merchant, the mechanic and the farmer, that those monuments, silent though they be but to my mind terribly eloquent, the abandoned farms, which we now see existing throughout Maine, can be made to blossom like the rose. It is the duty, it is the province of the Maine Board of Agriculture to protect, to rejuvenate, these abandoned farms. And so Bangor, recognizing that whatever is done here by you is for her interest, is for the interest of Penobscot county, is for the interest of the whole State, makes haste to welcome you here to-day, to offer you the hand of fellowship, and to express to you her sincere gratitude that you are here with us. Ladies and gentlemen, representing his Honor, the Mayor, and in behalf of the citizens of Bangor, I extend to you our sincere thanks for your presence and offer you the freedom of the city. Bangor is yours, her public buildings are yours. She regrets very much that you have come at so unpropitious a time of year, but she makes haste to assure you that her welcome is much more warm and cordial because of the inclemencies of the weather. We hope that your visit among us will be pleasant and profitable, that your departure may be a cause for regret, and that you will visit us again as soon as possible.

CHARLES S. PEARL, President of the Bangor Board of Trade.

After having listened as you have to the words of welcome on the part of the city by Alderman Donworth, it seems to me that you must be assured that your lines for the present are cast among friends. It becomes my very pleasant duty, in behalf of the Bangor Board of Trade, by whose invitation you are holding your annual meeting in Bangor, to extend to you a most sincere and cordial welcome. We welcome you as a Board of Agriculture, we welcome you individually, but we welcome you more than all for the purpose for which you have met, that is, the uplifting to a higher plane of the agricultural interests of the good old State of Maine. We are coming to realize to-day that Maine is a State of wonderful resources, not only in its timber, as we have felt during the years of the past, not only in its grand old hills of granite which are the entailed wealth of this State, not only in its forests and streams which entice to our midst the men who are interested in hunting and fishing, but we have come to realize that the State of Maine stands not far behind any other state in its agricultural resources. So I say we welcome you because you have come here for the purpose of educating and elevating those of our fellow citizens who are connected with the farming interests of this State, that they may live after a more exalted condition in the future than they have in the past. We cannot go out and look upon broad fields of wheat and corn as in the states of Illinois, Ohio, Indiana, or some of those grain raising states, but we can go out and gaze upon the hillsides and the meadows, where we find as fine grazing as can be produced in any state in this Union, and from that comes the best milk, the richest cream, the finest butter that can be produced in this country. I am sure that your aim is that the farming interest of this State shall be guarded and educated in the line of producing the very best from the very best material. Simply to own a few acres of land, as in days gone by, with a house and barn upon it, does not to-day signify what it means to be a farmer in the truest sense. The time has come when business men realize that farming is a business, and that to do farming with success you must do it as a business man would do his business. You must see to it that your sons and your daughters who are to follow you in the line of your business, are educated for farmers. The time has been when to be a farmer seemed to be something that perhaps was not up to the standard of what man might attain; but as I look upon the honest farmer who is striving to the best of his ability with the mind that God has given him, to educate his sons and daughters that they may produce the best that it is possible to bring from the soil that God has given them, then I say he is occupying one of the most exalted positions that comes to man. I honor the farmers of this State, because I know that they are a class that has not a superior in any line of business or profession. Members of the Board of Agriculture, we extend to you a most sincere and cordial welcome, because we believe you come into our midst with the spirit and the determination that you will be helpful to the good old State of Maine. We welcome you to all that we have. In behalf of the mayor, Alderman Donworth has given you the freedom of the city. In behalf of the board of trade I give you the liberty of all that the board of trade has. Make our rooms your home while in Bangor; and if there is anything which the board of trade can do to make your stay a pleasant one, we will endeavor to do it. We sincerely believe that this meeting will prove of great profit and interest, and hope that you will go from us with the feeling that you have indeed been among friends, and that you have received that benefit for which you hoped.

## RESPONSE.

By Secretary B. W. McKEEN.

I am very glad indeed to stand here and for a few moments testify to my appreciation and my gratitude, as a representative of the Board of Agriculture, for the kindly, sincere and eloquent words of welcome that have been given us by the representative of the city and by the representative of the Bangor Board of Trade. I believe that it counts much for progress in our business, in our profession as farmers, when we see the lines that formerly have divided the country from the city and the village gradually being obliterated, and each and every man coming closely in contact with his neighbor. I believe that very much of the education that has come into the farmer's life has been of value to him simply because it has had a tendency to break down these old, imaginary barriers. The farmer, although he represents the foundation business of our State and of our country, is not alone responsible for its prosperity. Very much of the prosperity of this country depends upon the genius, the enterprise and the progressive spirit of the people who are investing their money in our railroads, both steam and electric, in our manufacturing plants, in our lumbering operations, and in our quarrying. And I believe it should be a part of the province of our agricultural teachers from now on, more than ever before, to teach that each is dependent upon all, and that as one industry prospers all other industries prosper with it. It is exceedingly pleasant for us to meet here in this Queen City of our State, a city surrounded by good farms and good farmers, a city filled with business men and business enterprises, a city of great achievements, to hold our fourteenth annual dairy meeting. It was pleasant to us that the Pomona Grange of this grand old county of Penobscot should take such an interest in this meeting as to join with the Board and to offer special prizes for exhibits along the various lines in which we are laboring at this time. It does seem to me that we have met here under the most auspicious circumstances, which, if we lend our minds and hearts to our work cannot help to bring to us success. I believe that we are particularly fortunate in the speakers who are to address us. Of course we are all familiar with our home speakers, and we all delight to listen to them, and we are glad as they increase their funds of knowledge and broaden their means of information. And we have also speakers from three other states, in different parts of the country, men who are eminent in the profession of dairying, and I hope that our farmers will be able to carry home thoughts from them that they shall put into their work and that will be of great assistance to them in the future. In closing, I sincerely thank the members of the city government and the representatives of the board of trade, both personally and for the Board of Agriculture, and for all who are interested in this meeting, for the welcome which has been extended to us.

# THE AYRSHIRES, GUERNSEYS AND JERSEYS AT HOME.

By Prof. G. M. GOWELL, Orono.

We are all aware that there has been a wonderful advance since we commenced the work of dairying, and not the least of that has come from the great change that has been wrought in our dairy stock. When we left our beef raising, as we did 30 years ago, and undertook dairying, we commenced that work with a very inferior class of animals, animals that had been used for beef production and for work on our Maine farms, and it was very difficult indeed to get a sufficient quantity of milk and butter from those animals to make the work remunerative. So, in the first place, we had to build up and improve our dairy stock, and we did it by taking for a foundation that old, native New England stock that had lived and starved as our fathers did, here in the woods. Now while we have bettered the condition of those animals by better care, better feed and better handling, we have not relied wholly on our own work but have reached out to other countries and brought in the blood of those breeds of animals that were adapted to milk production. We have made use of the work that other men have done for 200 years preceding us, and brought in these animals and bred them to our old native foundation stock that had a strong constitution and a great deal of vitality. We have grafted this producing blood upon the old native stock in just the same way as we graft the improved varieties of fruit upon our native apple trees. We have probably in New England today a class of dairy animals not excelled in any other section of the country, and it is because of the intensive work which we have practiced. The first dairy breed was the Ayrshire. She was brought to Canada first, and was brought there in great numbers because of the close sympathy with the mother country. Now the Ayrshires at home are treated very differently from the Ayrshires when they arrive in this country, or from the cattle which we have here. The Ayrshires at home are kept out in the open air much of the time. We are doing our dairying here in New England under extreme conditions. We are trying to farm through six months of the year when we must give our animals summer conditions in order to get fair returns; so we put them in warm barns and attempt to furnish summer conditions. The Ayrshire cattle in their native country are in a comparatively warm climate, for those old English and Scottish lakes have not frozen over for seventeen years. At home they are able to run out in the pastures during the entire winter, with the exception of a few days at a time. The necessity for close housing does not exist, and it has never been practiced as we practice it here. They have stone barns, with no glass windows, rudely lighted and ventilated from the open doors. The cattle are kept there only during the nights and during the cold, rough storms, and even then the doors are open to the South, so they have good ventilation. The Ayrshires are confined to about two counties, Ayrshire and an adjoining county, covering perhaps a radius of fifty miles. All over England and Scotland each breed has its particular place and stays there. This does not hold true of the Shorthorns, because they are known all over England and are kept almost everywhere, but the Ayrshires are confined to one locality. A part of the country is rolling, much like New England, and a part is very flat and level. The soil is a reddish sandy loam. The land is very high priced, the rental being from five to ten dollars per acre. I have in mind one Scottish farm, now in the hands of the grandson, formerly owned by a man who was the first mover in the establishment of the Ayrshire Herd-Book. It is a farm of three hundred acres. The man has seventy-five Ayrshire cattle, and is buying this season 200 mountain ewes and breeding them to Leicester bucks, so that this farm is carrying an equivalent of 150 cows. He pays a rental of $1,400 a year for the three hundred acres. His work is quite intensive. He is fertilizing his pastures by the use of commercial fertilizers each year, using one-half a ton of slag per acre, costing about $10 a ton. His cows are fed on those pastures from early in the spring until cold weather in the fall. Then they are taken to the buildings and fed hay and roots. The cows on that particular farm calve in the spring and go dry in December. The milk is made into cheese during the summer. On other farms the cows are milked for ten months. This is an ideal Ayrshire herd.

There are also on this farm some twenty two-year-olds, twenty or more yearlings, and twenty to twenty-five calves. The cows are turned out in the yard each day and fed as I have indicated. They are given no grain during the winter, and the two-year-old and yearling heifers are kept on the hills, having a chance to run under the stone sheds, but not being tied up. When the weather is bad or the snow too deep for them to graze, they are fed some hay. They are given no roots but are given two or three pounds of oil cake per day, and they grow grandly. The yearlings are treated in much the same way, but the calves are kept in yards near the home and are fed a small quantity of hay. The Ayrshires are never closely confined. They have almost the same shaggy look that the Highland cattle have, and there can be no question but they are the descendants of the old Highland stock. The one impression they gave me was the capacity to work. Those animals have large barrels, they can carry a great deal of food, and they have strong constitutions, never having been confined. They have an immense amount of vitality, and have the capacity to convert food into milk. They also have grand udders. The old difficulty that the Ayrshire used to have with us of short teats surrounded by the long hair on the udder has been entirely overcome among the better breeders. The cattle have good teats, well placed, large, square, flat udders and the typical milk form, and are large milkers. One Ayrshire cow I have particularly in mind that yielded last year over 10,000 pounds of milk, and her yield of butter when she had been in milk eight months was one pound and a fraction over, per day. The Swedes are coming there and buying the stock to quite a large extent, and carrying it back to Sweden. In the lowlands in some places the cows are milked harder than on the farm of which I have spoken, but they are always given this same amount of freedom. I think we never introduced any breed to the dairy stock in Maine that did more good than the Ayrshires. They have been bred for a long time, and they are prepotent. Wherever we find the least strain of the Ayrshire we find this peculiar marking,—the brown spots on the white or the white spots on the brown.

The Jersey stock, which we regard as the foundation of our work, was raised under different conditions. They were raised in a milder climate, and made greater pets of. I want to call your attention to the conditions under which the Jersey cows have been raised. Lying in the British channel, seventy miles from England and fifteen from France, are the two islands of Jersey and Guernsey. They are low lying islands, they are rather rough in their formation, and they have been terribly swept by the winds. In order to overcome this great exposure, away back in the past somewhere they built earth walls around every one of their fields. The fields are small, not more than two or three acres in extent, and around these and up and down every road are these earth walls, three feet wide, five feet high and one and one-half feet at the top. Now they are thickly covered with sod, and growing out of those earth banks are hedge plants, bushes and even trees. And, by the way, the hedges in Jersey and Guernsey are not pruned much. They are allowed to grow at will, and consequently this growth has gone up from four to fifteen feet or more, so that the whole island is divided up into little fields surrounded by earth walls and hedges and bushes, and it is completely sheltered from the wind. This protection is a great advantage to the growing of crops there, and it gives a grand opportunity for the animals to lie in the sunshine. The farm buildings are also sheltered in this way. It is one of the cosiest sights. Sheltered thus, so that they are able to run out of doors so much of the season, the Jersey and Guernsey cattle have been developed under very different conditions than those on the Scottish Highlands. The way the Jersey cattle are treated there is very different from the way we are treating them here. There are stone barns covered with tile or slate with no windows except little openings in the wall hardly large enough to force your arm through, but the doors open to the south. These barns are surrounded by high stone walls. The animals are fed in the yards during the roughest of the weather, but for the most of the winter they are tied out in the open air. During the summer the cows never go to pasture, but are tied out with a rope about twelve feet long and a chain that circles around the horns. As soon as the grass starts in the spring they are tied out in that way and kept there until the cold weather comes in the fall, and during mild weather in the winter they are also tied out. The forage is not cut, but a peg is driven down, to which the cows are tied, and this peg is moved three or four times a day, according to the density of the growth and the amount of food the animal can get. The cows are watered in the field and many of them are milked in the field. Others go to the barns and are milked and then led out again. With this treatment the animals are kept in the open air much of the time and have a good amount of hardihood. As to the intensity of the work, the little island of Jersey, which is only about forty square miles in area, annually sells one and one-fourth million dollars worth of potatoes. The Jersey man gets his money from raising potatoes for the English markets. The yield of potatoes is from 300 to 500 bushels per acre and they bring from seventy-five to 100 pounds, or from three to five hundred dollars. The land is fertilized with cattle manure, with chemicals, and largely with rockweed and marine manures that they get so readily there. The land is worth from one thousand to twelve hundred dollars per acre and rents at from forty to fifty dollars per acre, but I am glad to say that but little of this land is rented. It is mostly owned by the people who live on it. And the Jersey people are very different from the English and Scotch. They are bright, and will look you in the face, answer your questions quickly, talk with you and show that they are people who live on and work the land they own. Three-fourths of the land is owned by the workers, and on the other one-fourth rent is paid. They are working high priced land and must get money somewhere to pay the rent or the interest. Their dairying, or rather their butter making, is not of a particularly high type. They are not using the best methods, but yet they are making a very good quality of butter on both islands. It is nearly all sold at home. Their cows are not fed on the great grain rations that we feed. They are fed freely on succulent foods, especially on the red clover in bloom. When we were there the fields were completely in bloom, and the animals were feeding it down very closely, so there was no food wasted. The open air is given to the Jersey in her native home, that which we have taken from her. We breed the Jerseys here, and cross them with our animals, and, living in this cold climate, we have to put them into barns to get them to do reasonably well. We have kept them shut in during the winter, and you know very well the results. We have many herds that are entirely satisfactory, but we have many other herds that have broken down. It is the boast of the Jersey and Guernsey people that they never knew a case of tuberculosis on either of those islands. How true this is I cannot say, but if it is so, what is the reason? Because the disease has not been brought on by the close confinement which we are giving our animals. We must in some way avoid close confinement and lack of exercise which our animals are having if we would maintain them and have them last and produce as they should for us.

Regarding the value of the stock there at home, these people are working under high pressure, they are thoroughly alive to the importance of the work they are doing and the value of their stock for foreign markets, and they are trying to breed what foreigners want. In the main they have not practiced inbreeding very much, but for the sake of fixing certain families they have to a certain extent. As a rule they are very pronounced against inbreeding, keeping the matter of constitution closely in mind. The parishes on the island are comparatively small. There are eleven parishes, and each one of these has its exhibition every year, where the people come together and prizes are awarded, and then the Royal Society is over the entire island. All of the winners in the parishes may compete for the Royal awards. It was surprising to me to find the people in one parish so thoroughly familiar with the people in every other parish, discussing the merits of the animals freely. It was very plain that the people in the entire island, and the same held true in Guernsey, were thoroughly familiar with what each other were doing. I put my hands on their best animals and on their poorest ones, and tried to find out what they were doing as compared with what we are doing, and this is the lesson that came home to me every time: They have a stronger class of animals than we have. Their Jerseys are larger, they are better developed, they have more constitution than our animals. I suppose a large part of that has come from the fact that they reject the poorer animals and save only the better ones. We here have been trying to push our work along, and had to raise both the poor and good animals in order to get enough to go around. We must abandon that line of work. Then they have kept the cows out in the open air so much of the time that they have preserved their vitality and constitution. I do not mean to tell you that they have better animals than we do, because I do not think they have, but more of their animals are good than are good with us. They are feeding only moderate grain rations and they are giving succulent foods throughout the year. They are milking the cows for ten months of the year. The first lesson that we learned was that we must not have cows boarders. They must give milk all the year around. If a cow went dry very long nobody wanted her. This came near ruining our cows. We have sapped them of their vitality, and the calves are born physical weaklings. But when the cows are allowed to go dry two months, as is practiced by all of the Jersey people and the better breeders here, the calves have more constitution. Again, they are raising so many vegetables that they do not feed a large amount of grain. They grow succulent foods and feed them from the fields in the summer and harvest them for winter feeding. They are raising a large amount of parsnips. While they are excelling in certain directions, they are doing a great deal of their work in a crude, heavy way. The parsnips and the beets are sowed on well prepared land by hand, broadcast. There are no rows at all, but they go out into the field and hoe over the entire surface, leaving the plants about seven inches from each other. We have not time to do that. We put in our horses, and get pretty nearly as good results. But it will be a long time before they change their method, because they are slow to change. They grow from 1,000 to 1,400 bushels of parsnips per acre. The soil has been under cultivation for hundreds of years. It has been deeply tilled and the parsnips run down deep and grow very large. An acre there is about one and one-tenth acres here, if I remember rightly. They feed parsnips first, during the fall months and early winter, and then carrots and later beets. They save the beets by putting a little straw or chaff on the outside. In this way they carry them through the winter and have them to feed in May, June and July, and even to the middle of August.

The prices of the Jersey cattle are extremely high. The people know that the foreigners are ready to pay for them when they can get what they want. Mr. Cooper of New York, who has imported so many animals, is buying about all that are being brought to America. I do not think Mr. Cooper is buying animals of the greatest producers, but he is buying animals from certain fashionable families, and cornering those families, and is able to obtain high prices, as he has on Golden Lad stock in this country. The cows sell ordinarily at from eighty to 100 pounds or from four to five hundred dollars, those that are good enough to go away from the island. When an animal has won in the Royal Society and the stock is exceedingly popular, they will ask $1,500 or $2,000 for it. Two-year-old heifers that are in calf, and are to breed within six months are worth from eighty to 100 dollars, if they are not prize winners. So you see that animals are very high priced there, but not very many sales have been made in recent years. They do not breed their heifers until they are two and one-half years old, and this is where we have made our mistake. Because the Jerseys and Guernseys were willing to breed at an early age we have allowed them to do so, and have made mothers of them when they were only half grown. This has tended to dwarf them, and we have stock that is narrow and peaked. If a heifer is kept until she is two and one-half years old, she has growth, and although we have not stimulated her milk organs, yet she has size and we are fairly sure of a cow of sufficient capacity to do good work. We have not ruined her constitution by over work.

Away back in the past these people took those rough Normandy cattle and by their treatment of them, the women leading them out from the barns and carrying water to them at noon, and milking them, many of them, three times a day, they have made pets of them. While having bred them for this special purpose of milk production, they have so refined them as to make them nervous, but have left them with their vitality and constitution because they have kept them in the open air.

The people of Jersey and Guernsey live in little stone houses and the most of them are clean. They are a tidy people. It is the coziest country that I ever saw. The Jersey cow came to us from good associations. They feed no silage, and grow no corn. I saw only two patches of corn, and those were in gardens, either in Jersey or Guernsey or in Scotland. There is not much difference as to which of these breeds sell at the higher price. Certain families that are bred for the purpose of making sales to American breeders may sell high in either breed. One cow that I was particularly interested in was seven years old, had been in milk 280 days, and then gave one pound and eight ounces of butter per day as an average for a week. She was offered for sale at eighty pounds, a little less than $400.

I was interested in the way in which these cattle are loaded for shipment. They were making a little shipment to Canada. They had a cage made just large enough for the cow to walk into. She was led up and walked in as though she was walking into a stall, and the door was fastened behind her. The cage was lifted up in the air and she was swung over the hatch of the ship and lowered down into the steamer. At the other end of the route she was walked into a stall and tied there. The animals are treated very carefully.

Ques. Do you think it is a good idea to keep cows in the barn all winter without exercise? Many writers claim that a test has been made and those that had the exercise did not do so well.

Ans. They may not do as well for the time being, but you cannot violate the laws of nature without finding trouble sooner or later. Shut your boys or girls in and for a time they may thrive, but sooner or later they will pay for it. Our cows must have exercise and good, pure air, and how are we going to bring this about here in Maine. How can we pursue a specialty and still maintain the quality of our stock? I think we must be content with a little less income from them, and we must provide ventilation. The little openings called ventilators are not sufficient. The ventilating shaft must run up to a high point, and it must be large so as to carry up a large volume of air. Make the chimney tall enough, running up the wall, following up the roof and there terminating. It will carry off a large volume of air if it is tight. There must be no openings up and down the sides. Put several of these ventilators up and down the tie-up, and then provide some means for giving the cattle some exercise each day. They should not be exposed in the wind or stand too long in the cold, so that they will use too much of their food to produce heat, but give them some pure air and exercise.

Ques. Would you have the ventilators in front or behind the cattle, or on both sides of them?

Ans. I would have them where it was convenient to place them, not having the animals in a draft. If you have no openings around the walls, let the ventilators open where they will and there will be no draft.

Ques. You think that even in cold weather the cows should be turned out?

Ans. I would not turn the cows out to slip around on the ice and wrench themselves, or to stand in the snow, or in extremely cold weather, but there are very few weeks when there are not several days when they can go out in the sunshine for a little time, not long enough to get chilled.

## THE GUERNSEYS AND JERSEYS IN MAINE.

By JOHN F. BUKER, Bowdoinham.

One of the most progressive ideas of the times is that of the rearing of thoroughbred animals. We find that a different class of people have come upon our farms. They are making a study of the animal; they have got to be intelligent men. The old fireside farmer who did the work by manual labor has passed away, or is to pass away. We find that it is the intelligence of our farmers, not musclar strength alone, that is needed.

This is a broad question, this question of Guernseys and Jerseys in Maine. Of course we mean Herd Book animals. What is a Herd Book animal? We mean an animal with a pedigree. What is a pedigree? It is nothing more or less than the family record; the same as you have of yourself in the family Bible.

In the breeding of registered stock, as in any other branch of farming, it is very essential that the first principles be correct, for if they are not we shall surely fail. Right here, in my judgment, is where a good many people who have tried thoroughbred stock have failed.

There are quite a large number of Jerseys in Maine, some extra good ones, and some, I am sorry to say, that are very poor. Perhaps a little history of the early importations would be of interest to some of you.

"William S. Grant of Farmingdale was one of the first, if not the very first to introduce and breed the Jerseys in this State. His stock was purchased in 1852 or '53, of Samuel Henshaw of Boston, by whom it was imported from the island of Jersey. The bull Old Duke (which figures quite largely in the pedigrees of many of the early Jerseys kept in Maine) was purchased by him of Mr. Henshaw, also one or two heifers.

The Jerseys introduced into Winthrop by the late Dr. E. Holmes, were the bull Butter Boy and cow Pansy 3d, both obtained of Mr. Henshaw; the latter having been imported by him, and the former from imported stock. The bull was brought into Winthrop in July, 1855, and the cow Pansy 3d in August, 1856, being then three years old. The sire of Pansy 3d was Sailor Boy, her dam Pansy. At the time these animals were introduced into Winthrop, but very little was known of the breed, and the plan of introducing them into this State was ridiculed by many as a wild and visionary one. In 1856 Pansy 3d dropped Jessie Pansy, whose sire was an imported bull belonging to Mr. Henshaw, and was the first pure blood of this breed dropped in Winthrop. When ten years old she was sold for $175, and went to Albany, N. Y. Pansy 3d dropped seven heifer calves in succession, some of which have ranked among the best cows in the State. Buttercup, calved in 1854, was one of the famous Jerseys in this part of Maine. She was imported in her dam from the island of Alderney, by Mr. Thayer of Brookline, Mass., and was afterwards owned by the late Dr. Holmes and by him sold to A. Robinson of Winthrop. Afterwards she was again sold to Massachusetts, at the age of 16 years. Her stock was superior, and, a good authority says: 'Four quarts of her milk would make a pound of butter; and she was not dry for a number of years—making seven pounds of butter per week from the time of going to the barn up to the time of calving.' Lilly, imported by George Brown of Boston, was purchased by Greenlief Smith of Winthrop, in 1863, and was one of the best butter cows ever brought into the State, having yielded 17½ ℔s. of butter per week. Fanny 2d, owned for a number of years in Winthrop, made 16 ℔s. of butter per week. At the age of ten years she had been dry but a few times, and farrow but once, and had given from four to six quarts per day at the time of calving. Lloyd H. Snell of East Winthrop was at one time largely interested in the breeding of Jerseys, and owned the cow Victoria Pansy which was from the Henshaw stock; and also the cow Buttercup, of which mention has been made. In and about Winthrop and other sections of our State, the Jerseys bred from the above animals have been largely disseminated, and the cows have had a somewhat noted record as milkers. They have been sold at high figures, and even some grades have brought from \$100 to \$150. For pure bred cows sales have been made at \$150 to \$240 each. In 1870, Mr. A. Robinson sold some animals, which were taken to Nebraska, and others were sent to Massachusetts, Vermont, and New Hampshire. In 1872 one car load of fifteen pure bred Jerseys were sent to Denver, Colorado, having been purchased by Rev. W. Scott of that place.

The first Jerseys owned in Sagadahoc county were purchased in 1859, by Rev. S. F. Dike of Bath, of Mr. Grant of Farmingdale; and subsequently Mr. Dike sold animals to Hon. C. J. Gilman of Brunswick and M. E. Rice of Stetson. About the time that Mr. Dike purchased his animals of Mr. Grant, Maj. Thomas Harwood of Bath imported two cows and a bull from the island of Guernsey, which were bred with care for some years, and disseminated somewhat throughout that section of the State. George Sampson of Bowdoinham, some years since had a herd of five or six Jerseys, obtained of stock purchased of Thomas Motley of Roxbury, Mass., and bred to the Harwood bull before spoken of. James W. North, Jr., of East Jefferson, purchased his first cow of P. H. Holmes of Augusta (a descendant of the Henshaw importation) and a bull of Dr. Boutelle of Waterville. He also purchased other animals of Dr. Boutelle. G. J. Shaw of Detroit commenced his breeding operations with this breed of stock in 1866, by purchasing animals of M. E. Rice of Stetson and A. Robinson of Winthrop, the latter being the bull Champion, descended from the Henshaw blood. In 1871 Mr. Shaw purchased the cow Clover, (recorded in the Jersey Register of the Association of Breeders of Thoroughbred Stock, No. 270), and also other animals from other parties, with which he kept up his breeding operations until the fall of 1872, when he purchased the bull Nutshell, and two heifers, of Col. G. E. Waring of the Ogden Breeding Farm, Newport, R. I., all the animals being recorded in the Register of the American Jersey Cattle Club. The "Millbrook Herd" of Dr. N. R. Boutelle was commenced in 1865, by the purchase of animals in Winthrop which descended from the Dr. Holmes or Henshaw stock. 'The animals,' says Dr. Boutelle, 'not meeting my expectations, and having no evidence of purity of blood, were disposed of the following season. The next purchase was of animals of doubtful blood, although reputed to be thoroughbred. Being satisfied this was not the proper course of breeding to establish a herd, Dr. Boutelle purchased a bull and two cows in 1867 of C. Wellington of Lexington, Mass. One of the cows was subsequently sold to the Insane Hospital at Augusta. In 1869 animals to increase the herd were purchased of Col. Waring of Newport, R. I., and also of F. E. Bowditch of Framingham, Mass., from stock of his own selection on the island of Jersey. Subsequently some of these animals were sold to H. H. King of Calais. Some choice animals were in 1870 obtained from the herd of Thomas Motley of Jamaica Plains, Mass.; and in 1871, Dr. Boutelle visited Canada and purchased six animals from the famous herd of S. Sheldon Stephens of Montreal."

I wish to say a few words in relation to the Maine State Jersey Herd Book. We find that the last volume, No. 9, issued this year, brings the published work of pedigreed animals up to 5299. There are some of these owned in nearly all parts of our State. They have become quite noted for their dairy qualities, a goodly number of them having produced over fourteen pounds of butter in seven days.

There are also some quite noted herds of A. J. C. C. Jerseys in Maine, new importations coming into the State nearly every year. This year is no exception to that rule. I know of two one-year old heifers and one cow being brought into the State at a cost of over $800.00.

The Jerseys in our State compare favorably with those in adjoining states. Especially is this true in the matter of production. While we have never bred a Mary Ann of St. Lambert, a Merry Maiden or a Brown Bessie, yet quite an amount of this blood is owned in Maine to-day.

At the New England fair at Rigby Park, Portland, in 1895-96-97-98 we found that the Jerseys here in Maine stood well in competition with herds outside of our State. We also note that in the Sweepstakes cream test for five cows bred for butter Maine won the $50.00 prize each year and this in very fine company.

We find there have been registered in the A. J. C. C. Herd Book about 200,000 cows and about 70,000 bulls. We know of one county fair held in Maine where eighty registered Jerseys were on exhibition.

Now as to their cousins, the Guernseys: Up to October 1, 1901, there had been registered in females about 14,000. There are probably not more than seventy-five registered Guernseys owned in Maine to-day. It is a breed to which popular attention has been called in recent years and in my judgment it is deserving of a higher place in public estimation than it has formerly held. Until the year 1901 no breed was so little known by the dairymen of our State. At the Pan-American Exposition there were four herds of five cows which averaged for a full year from 450 to 554 pounds of butter, or an average for the four herds of 488 pounds. Six cows in single classes made records of from 504.5 to 912.5 pounds of butter, or an average of 689.03 pounds. And yet, notwithstanding such strong claims upon the attention of the farmers and breeders, there are very many people in our State who have never seen a registered Guernsey cow, and there are a vast number more who have never seen their milk or butter. It is a characteristic of the breed to produce the deepest colored milk and cream, and the most golden colored butter.

The most remarkable characteristic of the Guernsey is the richness of the animal. It is seen in every point. The hoofs are like tortoise shell, the skin soft and of a yellow golden tint, and the inside of the ear is still more highly colored. In form they are larger than the Jersey, showing more length between hip and shoulder, with large, deep barrels. They are as strong and vigorous as the ordinary cow, and are capable of taking care of themselves in the common herd.

The Guernsey is eminently a dairy cow, and pre-eminently a dairy cow for the practical farmer. The weight is from 900 to 1,400 for cows, and 1,700 pounds and over, for bulls. The number of Guernseys is so limited that it must be many years before large herds of thoroughbreds can be numerous. Hence the main reliance of dairymen in this breed must be upon grades. Already a demand exists which is not supplied.

## FERTILIZATION OF THE SOIL.

By Edward B. Voorhees, Director New Jersey Agricultural Experiment Station.

Farming is not a "hit or miss" business; it is a business that is controlled by law, that is based upon certain principles that are eternal and unchangeable, and which must be understood and observed if made successful. We are a country so rich in natural resources, so abundantly are we blest by soil and climate, so large are our areas, and so relatively little the demands upon us for genuine effort in the matter of increased production, that it is just beginning to be realized that the possibility of a shortage of any food supply is not improbable; that to meet the future demands we must not only conserve our fertility, but take rightful advantage and use of artificial supplies of the needed elements, one of the most important of which (phosphoric acid), fortunately we have in the almost limitless deposits in our own country.

In the first place, it must be remembered, that fertilizers are fertilizers only when they contain one or more of the essential constituents of plant growth, viz: nitrogen, phosphoric acid and potash, and which are liable to be exhausted from the soil more quickly than the others, and in the second place, that these constituents contained in such materials as nitrate of soda, sulphate of ammonia, acid phosphate, ground bone, muriate of potash, etc., constitute plant food, and that their application to the soil will contribute quite as much to the growth of crops as the constituents already there and in many cases in a much greater degree, because more readily obtainable by the plant. The chief difficulty where satisfactory results are not obtained from their application in soils deficient in available food, lies in the fact that the person making the application does not understand the character of the material that he is handling, or the characteristics of growth and specific needs of the plant, whose growth he intends to encourage. While, therefore, the value of a commercial fertilizer is determined almost exclusively by the amount and form of the nitrogen, phosphoric acid and potash which it contains, it does not follow that all soils or crops will respond equally to applications of materials containing these elements, because the needs of soils and the requirements of crops vary.

Soils differ in respect to their needs for specific elements, owing either to their method of formation or to their management and cropping. A sandy soil is usually deficient in all the essential plant-food constituents—nitrogen, phosphoric acid and potash,—while a clayey soil usually contains the mineral elements in abundance, particularly potash. On the other hand, a soil very rich in vegetable matter is frequently deficient in mineral matter, while a limestone soil is likely to contain considerable proportions of phosphoric acid. These are the indications in a general way, and they explain why it is that different kinds of soil that have not been cropped differ in respect to their needs in reference to the different fertilizing constituents.

Methods of management and cropping also exert an influence; for example, soils of equal natural fertility may not respond equally to uniform methods of fertilization, because in the one case a single crop, requiring for its growth proportionately more of one of the essential elements than of another, is grown year after year, and it may be that the element required is the one that exists in the soil in least quantity. On the other hand, crops may be grown that demand but minimum amounts of the element in question; hence its application to the soil for the one crop may be followed by largely increased returns, while for the other but little if any increase in crop is apparent.

In the matter of management, too, a considerable variation may be observed. One soil may lose a large portion of its essential constituents, because no pains are taken to retain for the use of the crop the constituents annually rendered available through the natural agencies of sun, air and water; while in another, by means of careful cultivation, and the use of absorbents and catch crops, the constituents made available are largely retained.

Crops also differ in respect to their power of acquiring food. The legumes, a class of plants which includes the clovers, peas, beans, vetches, etc., differ from other plants in being able, under proper conditions, to acquire their nitrogen from the air, and can, therefore, make perfect growth without depending upon soil nitrogen. On the other hand, the various grasses and grains are

POTATO FIELD OF B. R. BLACKSTONE, PERHAM.

Varieties, White Elephant, I. X. L. and Green Mountain. Ten acres; yield, 1,415 barrels. Fertilization, 18 two-horse loads of stable manure per acre, harrowed in, and 500 pounds phosphate in drill. Sprayed three times with Bordeaux Mixture.

not only dependent upon soil nitrogen, but they must have an abundance during their most rapid period of growth, in order to attain their maximum development. For the latter class of plants, favorable results are secured from the proper use of nitrogenous manures, while for the former class the application of nitrogenous manures simply results in supplying an element which could have been secured quite as well by the plant itself, without expense. Illustrations could be multiplied, though perhaps less striking than this, showing that the variations in crops in respect to their power of acquiring food are really very great, and a right knowledge of this fact has a most important bearing upon the economical use of commercial manures.

Another point of importance, the understanding of which is necessary in the adoption of an economical system of fertilization, is that crops differ in respect to the relation that exists between their fertility content and their selling price. In this respect they may be divided into two distinct classes, first, those which possess a relatively low commercial value, as the cereal grains, timothy hay and cotton, for example, and which contain and carry away when sold, a very considerable amount of fertilizing constituents, and second, vegetables and fruits, which have a high commercial or market value, and which contain and carry away when sold from the farm a minimum amount of the fertilizing constituents. Timothy hay, for example, will bring in average seasons from $10 to $12 per ton, and it contains, on the average, fifteen pounds of nitrogen, five of phosphoric acid and twenty of potash, while a ton of potatoes will bring from $18 to $20, and contain on an average 6.6 pounds of nitrogen, 2.4 of phosphoric acid and nine of potash. That is, while the timothy brings but little more than half as much as the potatoes, it contains more than twice as much of the various constituents. It is, therefore, apparent that in the fertilization of the first class, the cost of the application must be carefully considered, in order to obtain a profit, particularly if it is to be derived altogether from the crop to which the fertilizer is applied, whereas in the second class, the cost of fertilizer is not so important a matter from this standpoint; in that case the important thing is to see to it that such a sufficient abundance of all the constituents is present, as to provide for the highest possible yield. Plants, too, because of their habit of growth and their object of growth, must be fertilized in order to meet their specific requirements in this respect. It is not enough to know that the crop will require a certain definite number of pounds of the constituents to produce a certain definite increase, but it must be known whether the habits of growth of the plant are such as to require that these amounts of the constituents should be applied, and also whether the object of the growth is to obtain the ripened seed, or the succulent immature produce. A study of the corn (maize) plant, for example, has shown that notwithstanding it demands a very considerable amount of nitrogen for its best development, its period of most rapid growth and development is such that under average conditions of soil fertility, it is able to obtain from soil sources a larger proportionate amount of this element than the wheat plant, which makes its most rapid growth and development during a different period. That is, the corn makes its greatest growth during July and August, the season of maximum warmth and moisture, which encourages a rapid decay of vegetable matter containing nitrogen, thus providing it with its needs, while the wheat makes its most rapid development during May and June, before the warm moist season has arrived, and conditions are thus not favorable for the change of nitrogenous matter in the soil into forms available to the plant. Again, many crops which are grown for their matured products are relatively more exhaustive of the mineral elements than of nitrogen, and, therefore, require a greater abundance of these than if the object in their growth is the immature plant, as in the case of many market garden crops; the more essential constituents are then not the minerals, but nitrogen, as the presence of this element in excess encourages an early and rapid leaf and stem growth. These considerations suggest a system in reference to the kinds and amounts of fertilizers to apply under known, though variable conditions.

It is obvious that owing to the many conditions that exist, only suggestions can be made here, though it is believed that with a careful study of the foregoing, they may be useful as a guide in the adoption of a definite system, and for the purpose of illustration the following rotation is assumed: First year, corn; second year, potatoes; third year, wheat or rye; fourth year, clover and timothy; fifth year, timothy hay.

Observing the habits of growth of these various crops, and keeping in mind the fact that the object of the fertilization is to obtain a profit, the following fertilization, which is in line with the points previously discussed, is suggested. For corn, because it is not a crop of high commercial value, and because it is a rank grower, making its maximum development during the summer season, and, therefore, able to acquire its nitrogen more readily than the other plants in the rotation, the fertilization when the yard manures are used, which is a desirable practice, may consist mainly of the mineral elements, phosphoric acid and potash. The amounts to apply on soils of average quality need not exceed twenty-five pounds of the former and forty of the latter, which may be supplied by 200 pounds of acid phosphate and eighty pounds of muriate of potash, or 650 of kainit. Such an application will provide for a very considerable increase in the yield, as a crop of fifty bushels per acre will not contain more than thirty-five pounds of phosphoric acid and fifty of potash. Of course, where the land is light, or where no manure is used, these mineral elements should be increased and nitrogen should be applied, too, preferably in organic forms, as cottonseed meal, tankage, or dried blood. Potatoes are a crop belonging to the second class, and which, particularly if an early crop is desired, must be supplied, not only with the amounts that are actually needed in the formation of the crop, but with such an amount in excess as to provide as far as possible against any unfavorable conditions of season. Experience has shown that for early potatoes a mixture showing a composition of:

| | |
|---|---|
| Nitrogen | 4% |
| Phosphoric acid | 6% |
| Potash | 10% |

is a very desirable one, the nitrogen to be derived from the three distinct forms, nitrates, ammonia salts and organic matter, the phosphoric acid to be derived from superphosphates, and the potash derived from sulphate of potash, if special quality of tuber is desired, otherwise from the muriate. The amount to apply may range widely, though the best growers have learned that 1,000 pounds per acre is, all things considered, better than a larger or smaller amount. Because of the low content of fertilizing constituents in potatoes, an increased crop only sufficient to pay the cost of the fertilizer would leave a large residue, particularly of the minerals, for subsequent crops. The application for wheat, therefore, unless rapid soil improvement is a consideration, may consist of from 150 to 200 pounds of dissolved animal bone, or of a mixture of acid phosphate and dried blood, or cottonseed meal, showing a composition of three per cent of nitrogen and ten per cent of "available" phosphoric acid. If this method is used, the hay crop, the fourth in the rotation, will have at its disposal sufficient food to provide for a maximum crop, while the fifth crop, the timothy hay, may receive as a top-dressing in the spring, an application of 100 to 150 pounds of a mixture made up of:

| | |
|---|---|
| Nitrate of soda...................... | 150 pounds |
| Acid phosphate ...................... | 50 pounds |
| Muriate of potash .................... | 25 pounds |

which will furnish sufficient nitrogen at the time when needed to encourage a rapid and uniform growth, and sufficient of the minerals to prevent an undue exhaustion of the large application of quickly available nitrogen.

In this system, only those kinds of materials are used that are, according to the best knowledge that we have, needed for the best growth of the crops, and they are applied at such times and in such amounts as will be most likely to ensure a profitable return. In other words, the application of the fertilizers has been along reasonable lines, so far as we are able to discover it at the present time, and in any case no constituents are added that are not likely to be needed, nor are they added at such a time as to encourage their loss through the various means that have been pointed out in the discussion. This system is the opposite of the method now in use in many cases, which consists in purchasing from the nearest dealer that fertilizer which can be obtained at the lowest cost per ton, without regard to the constituents contained in it, or their form, and applying it to crops indiscriminately, without regard to their habits of growth, or their specific needs. There are undoubtedly cases where the cheapest material, if it consist of acid phosphate, may be the best to add, particularly to the cereal crops in the rotation, because, owing either to the original character of the soil or to its previous cropping, there is a deficiency of this element, but even in this case, it should be known that it is the one needed, and good returns cannot be expected in the long run, unless such knowledge is possessed by the grower.

In the case of special crops, those which are not grown primarily to furnish a large amount of nutritive matter, but rather for their peculiar and useful qualities in other respects, as the vegetables and fruits, systematic methods are also important. In the case of the more succulent vegetables, for instance, the cost of the fertilizer does not bear so close a relation to the value of crop as is the case with the staple products, and the best method that can be suggested at the present time, is to see to it that an abundance of all the elements is provided. This may be readily accomplished by the use of what are termed "basic formulas," which contain both large amounts and good forms of all of the various constituents, the one given for potatoes, for example, and to supplement these as the occasion arises, with applications of specific elements, as nitrogen for such crops as asparagus, lettuce, table beets, onions, etc., with phosphoric acid in the case of turnips and others of that class, and with potash salts for peas, beans and other legumes.

For fruits, which grow through a long period, those forms of fertilizer materials may be selected which decay slowly, in order to provide the food only as rapidly as it may be needed, and to prevent the over-growth of leaf and branch, particularly after the trees have come into bearing, hence the basic formula for this class of crops may consist of mixtures of ground bone, acid phosphate and muriate of potash, in equal parts, or even of ground bone and muriate of potash, the nitrogen to be supplied in this case only when the trees show by the color of the foliage that there is a need of nitrogen.

We hear much in these days of the advantage of gathering nitrogen from the air by the use of leguminous crops, and while really but a few farmers are utilizing as fully as they might this source of nitrogen, the fear of a larger use by them seems to have already excited the manufacturers of fertilizers, and has drawn from them, or their representatives, many arguments to show that this source of nitrogen is not to be depended upon, and that, all things considered, it is not likely to result in a profitable income to the farmer of this constituent. These attempts to obtain nitrogen from the inexhaustible stores of the atmosphere should be encouraged, though much needs to be learned concerning how far the introduction of these crops, as well as others, may be depended upon, not only in gathering nitrogen, but also what direct bearing the practice may have upon the conservation of soil fertility. In the first place, we do not as yet appreciate as we should the importance of keeping the soil constantly occupied with a growing crop. We do not realize as we should that any soluble nitrates that may be present in the soil in the fall, a time when there is a large accumulation of them as a rule, must be carried out of it by the heavy rains of the fall, winter and spring, unless there is during those periods a growing crop, which has the power of using and thus fixing it for future use. I mention nitrogen, particularly, because of all of the constituents it is the one more liable to be lost, not that the others are not lost, but because they are less likely to be carried out of the soil, than the nitrogen.

The leguminous crops, or "nitrogen gatherers," are believed to possess the power of acquiring nitrogen from the air, and thus are distinguished from all others which must obtain their supply from soil sources. Their advantage, then, comes in the enriching of the soil in this element, and in improving its condition, because in addition to the nitrogen the organic matter of the crop incorporated with the soil improves its physical and chemical character. It must be remembered, however, that any leguminous plant, in order that its nitrogen may be obtained from the air, must have in the soil a specific germ, the presence of which is manifested by the growth of nodules on the roots, and through which the nitrogen is obtained. All soils do not contain these bacteria, in which case it is necessary, in order that the powers of the crop may be used to full advantage, to have the soil inoculated, which may be done by adding to it earth that has been obtained from a soil in which the specific germ exists.

The point of particular importance here in reference to the fertilizer question, lies in the fact that plants belonging to this class are ravenous consumers of phosphoric acid, potash and lime, hence attempts to rapidly improve poor soils by means of them will fail unless they are supplied with an abundance of these minerals. The improvement of poor soils by means of clover, peas, beans, etc., will be in proportion to their ability to obtain the minerals, which on these soils must be supplied. There is no doubt that in cases where soils are rich enough in dormant constituents, but lack physical character, being either too loose, open or porous, or too compact, the growth and incorporation of these crops will result in very considerable and quite rapid improvement, due both to a genuine gain in the nitrogen of the soil from atmospheric sources, and to improved physical character.

In the next place, it must be remembered that the nitrogen gathered is in an organic form, and that soils that are most benefited are those which belong to the first class, and upon which general crops are grown, as the form of nitrogen is not such as to provide crops of the second class with their maximum requirements. Hence, the gain of nitrogen is useful for the staple crops, rather than for those grown for specific purposes. The growth of these crops for the primary purpose of gathering nitrogen will not result, even if all soils are planted with them, in reducing the need for nitrogen in the latter class of crops. In respect to catch crops, other than legumes, such as buckwheat, rye, etc., the gain in fertility or the conservation of elements is also considerable, due to the fact that the growing crops hold fast to these constituents that would be lost if the fields were left bare, and to the improvement of soils that would follow, due to the incorporation with them of the non-nitrogenous vegetable matter contained in the crop. These crops need the fertilizer elements quite as much as any field crops, and no direct additions of the valuable ingredients are made to the soil by their growth. In fact, if this line of farming is to be successful, it must be accompanied by the addition of commercial or other manures. The nitrogen gathered by these crops is soil nitrogen, and its conversion into a crop simply results in changing its form and place, hence catch crops of this class cannot be regarded as a substitute for commercial fertilizers in the permanent improvement of the soil, for their growth does not increase the content of essential fertility constituents. Furthermore, these crops as a rule contain less nitrogen, and that which they contain is apparently less available than the nitrogen contained in the green manures from the leguminous crops. In their growth, too, they appropriate the immediately available nitrogen of the soil and convert it into the less available organic forms. Hence, the crops that follow are frequently unable to obtain their food as readily as would have been the case, provided the green manure crop had not been grown. Leguminous and other catch crops have their place in progressive farming, but in order that they may fulfill their proper function, they must be fed; something out of nothing is no more probable in agriculture than in other industrial lines.

DISCUSSION.

Ques. What can we buy from which to get phosphoric acid?

Ans. We buy acid phosphate in our State.

Ques. What does nitrate of soda cost?

Ans. The wholesale price of nitrate of soda is $42 a ton, and of acid phosphate $10. We in New Jersey are very strong in the belief that nitrate of soda is one of the great forms of nitrogen for our use, particularly in asparagus growing. For sweet potatoes we do not use a pound of it, and yet ten years ago the man who bought fertilizer for sweet potatoes would probably buy the same thing as for asparagus. Down in our state a great many of the farmers club together and figure out what they will want,—so much nitrogen from nitrate of soda, so much from blood and so much from tankage, so much phosphoric acid from acid phosphate, and so much potash from muriate of potash—and then they ask the manufacturers what they will charge to make up the formula, and the manufacturers bid on it. In that way they get their mixture at a low figure. They have it analyzed before they pay for it, to be sure that they are getting the materials they have ordered. In this way our farmers are able to buy pretty near to wholesale prices. Other farmers buy the raw materials and mix them themselves. They order a cargo from South America, and of course get away down under the jobber's price.

Ques. What is the value of lime as a fertilizer?

Ans. Lime is not a commercial fertilizer in the strict sense, but an indirect fertilizer which all farmers ought to be familiar with and to use. Our farmers use lime about once in five years. They use it for two reasons: First, because they want it to act upon the insoluble plant food and make it available, and in the second place, it is good for sour land, land that has been farmed a good while and an acid has developed. Ten or twenty bushels of lime to the acre will neutralize the acid. Sometimes clover does not grow well, and the farmers say it probably needs lime.

Ques. Is there danger of using too much?

Ans. We have not found any particular danger. The old saying is that "Lime makes the father rich and the son poor." Lime makes the nitrogen in the soil available, and if I have nitrogen there I am going to put the lime in and get it out, and if my boy wants more nitrogen he can put it in. It is the injudicious use of lime that may result in making the land poorer. We have used as high as 150 bushels to the acre at one application. We have heavy clay land, and we used lime in studying the club root of the cabbage. It is very effectual for this.

Ques. In your observation have you been able to ascertain the kind of soil on which commercial fertilizers produce the best effect, as between sandy soil and clay loam?

Ans. In a general way we get more returns from our sandy soils, because we have nothing in them in the first place. On the red shale soils through the central part of the State we find that phosphoric acid is the element that probably of all others gives us the most profitable returns. And when we get farther north we want a fertilizer that will build rather than have a quick effect, because we do not grow the quick crops, except timothy. It is a very common practice to topdress for timothy in the spring, and a very profitable topdressing consists of 500 pounds nitrate of soda, 200 pounds acid phosphate, 200 pounds of ground bone, and 100 pounds of muriate of potash. The farmers do not think of letting a season go by without applying four or five hundred pounds of this mixture, half of which is nitrate of soda. They do not use the ground bone and the acid phosphate for the sake of the hay, but they think they will have to put it on later, and they can put it on with the mixture just as well. That application would cost about fifteen or sixteen dollars for a thousand pounds. In the hay section of the State they have a rotation of corn, potatoes and hay. After the potatoes come off they seed down to grass without any cover crop. The first year it has more or less clover in it. The next year the clover has disappeared and they expect to get the pure timothy, and they cut that one year more, or sometimes two years more, and on that they apply the topdressing which I mentioned.

Ques. Would it be wasteful to put on barnyard manure?

Ans. No; by all means put it on if you have it. The reason our farmers do not is that few of them keep any stock except their horses, and make very little manure relatively, but if you have a dairy and are making manure, by all means topdress with that. Some years ago I seeded down nine acres, three experimental lots of three acres each, one with manure from a narrow ration, one with manure from a wide ration, and one with nothing but commercial fertilizers. A great many farmers there have the notion that if we keep on applying commercial fertilizers they will burn out and rot the soil after a while. But the result of my experiment has been that every time I have gotten more crop on the commercial fertilizers than on the other manures, though this year they were very close together. The farmers come there and are very much surprised to learn that the piece has had nothing but commercial fertilizers applied to it.

Ques. Do you recommend the application of manure on the top rather than plowing it in?

Ans. No, I do not mean that. I mean that if I have the manure in the spring of the year, and have a grass field, and have no better place to put it, I would put it right on the grass, I would not leave it in the yard. I would not even preferably apply it to corn or some crop like that. We get more money out of it on our grass croo because it gives very quick returns. We put it on in May, and cut our grass in June, and sell it in July.

Ques. Is crimson clover profitable as a cover crop? I have tried it several times but could not succeed in getting it to winter.

Ans. It depends on how much you cut in the fall. If it grows very rank and you get a good stand in the fall I think it would pay to grow it. Next year when you sow the crimson clover mix about a pint of turnip seed and about half a pint of rape seed with it, to the bushel. Then if your clover goes you have the turnips, and if the turnip goes you have the rape.

In relation to the value of barnyard manure, we figured out that the constituents in a good, well-fed cow's manure, at the wholesale prices of commercial fertilizers, would average for a herd of thirty-five cows $21.76. But we have shown that if that is exposed on an average of less than three months, more than ten dollars' worth of it goes out. We put fresh manure on oats, and we got an increase of 275 per cent. The same amount of manure that had been leached and put on the same kind of soil, which was planted with the same kind of seed and handled in exactly the same way, gave an increase of fifty-eight per cent. More than half of the value is lost, because the materials that remain are not so soluble and not so easily available. The manure should be applied immediately or kept under cover.

Ques. What about the loss by fire-fanging, or heating?

Ans. There would be a considerable loss but there is no need for that to occur if the manure is looked after.

Ques. If the manure is spread on the land is there any loss from evaporation?

Ans. The evaporation is usually the fermentation, and as soon as it is taken out and spread over the land it cools and fermentation stops. There is usually no evaporation after it is spread out. If the rain comes it goes through it but it puts it right in the ground where you want it.

Ques. A good many farmers haul it into the fields and put it in a pile, and then spread it in the summer. Is there a loss in this method?

Ans. You can arrange your heaps so as to prevent loss, but it would be better to spread it on the land. There might be some loss in heating.

Ques. Would it be well to put it on top of the snow?

Ans. There is some question about doing that. If it is on a side hill, I do not think I would recommend doing it; and yet I remember that a farmer in our State, a former president of the Board of Agriculture, said that one year he did that, and when the snow went off in the spring and he saw the streams running he thought he had lost it, but he never had better crops than that year. Still you cannot help losing some.

Ques. Suppose it should be very dry for a long time after it was spread on the grass?

Ans. If it were applied thin I do not think there would be very much loss. There is what is called a dry fermentation which takes place sometimes, which results in the loss of nitrogen, but I would take my chances on that. If it is evenly applied it goes down next to the ground and absorbs moisture and stays there, and it is really better to have it there than anywhere else, in my judgment.

Ques. We have a manufacturing establishment where a great deal of ashes is made. The farmers buy them by the bushel or barrel and spread them on the land. Is there any danger of applying too much?

Ans. I do not believe there is much danger. There would not be with us, as we cannot get enough. I do not think a couple of tons to the acre would do any harm. We regard wood ashes as one of the very best sources of potash. Hard wood ashes, if they are kept clean, contain, with us, about twelve or fourteen per cent. of potash, and the soft wood ashes would usually contain about half of that. It would be a difficult matter to say how much potash there would be in ashes made trom a factory. They would be more or less mixed with dirt, dust and charcoal, and probably it would be difficult to get a uniform product. They might run up to five or six per cent. They should not be wasted, by any means. Anything that results from the growing of a plant will help to grow a plant again.

Ques. In what form do you consider it best to save liquid manure?

Ans. We do not use any special absorbent. We keep it covered, and see to it that not enough absorbent is used to cause it to heat or fire-fang. If you have too much bedding for the liquid it may heat. You should look after it and if you find any heat level it over. We have a cement floor, and the cellar is under the barn. We claim to take out the manure at least once a week, but it will accumulate in bad weather, and in two weeks it is not bad. We keep it spread out to prevent active fermentation. We use plaster in the stable, and sprinkle plaster over the heaps to absorb anything that would be likely to be lost.

Ques. Do you consider the liquid as valuable as the solid?

Ans. The constituents in the liquid are more valuable than in the solid, because they are practically all available. You will find quite as much potash, and more nitrogen, in the liquid than in the solid. The phosphoric acid is in the solid.

Ques. Would it be wasteful to spread manure and harrow it in in the fall?

Ans. I think not. In this climate probably the losses would not be very great. We plow heavy land quite often in the fall.

POTATOES RAISED BY W. E. JOHNSON, BOWDOIN.

Variety, New Seedling, 3 years from the seed ball; yield, 4 bushels from a piece 7 by 13½ feet. Sprayed 4 times with Bordeaux Mixture and Bug Death.

There are several good reasons for plowing in the fall, and several reasons for not plowing in the fall. We find it a very great advantage to have several acres all ready to go right on as soon as the ground is dry, and while there may have been a loss this is not as great as the gain we get in the spring. As a broad, general rule, I should not advocate it for everybody, but only where the conditions are favorable. Very likely it would be a good practice here.

### GEO. A. SMITH.

Prof. Voorhees has covered the subject very thoroughly and I do not think I can say very much that will help you on this subject of fertilization. I want to mention one point. The Professor told you that he grew certain crops with commercial fertilizers, but he did not tell you that he had handled that land in such a way that he had the physical condition of the soil the very best that it could be. That is why he got good results with commercial fertilizers. If he had handled the soil the way some farmers in New York have handled it—and I think there are a few in New England—he might not have obtained as good results. They have plowed the land and grown hay and grain, corn and potatoes, and have thrown the manure out by the side of the barn and left it there until the soul was all gone out of it, and then put it on the land to build up the soil and grow another crop. Those men would not have succeeded with commercial fertilizers. Commercial fertilizers contain nitrogen, phosphoric acid and potash, and those are the materials that will grow a crop providing the conditions are all right, but you must have a certain condition in the soil so that it will hold moisture. You may buy the best brand of commercial fertilizers that money will buy, and put it on the land, and if you do not have moisture there it is not worth anything. It is the moisture that puts it in a condition that the little plant root can take it and carry it up into the circulation of that plant and build it up. The man who keeps cows, as you do here very largely, if he manages his business in such a way that he saves the manure, as Mr. Voorhees has told you, and puts it on his land, and then follows a short rotation, or if he follows a long rotation keeps putting on some topdressing to furnish the necessary elements for the plant to grow and make more roots in the soil, can build up his land and make it profitable. But the man who keeps a cow and keeps her as some farmers do, who thinks that when he has filled her up he has fed her, and has that kind of manure to put on his land, and manages his business in that way all the way through, will not succeed on the farm.

One other thing I want to mention, that came to my mind as Prof. Voorhees was speaking in regard to drawing out the manure in the winter. Quite a good many years ago, when I was a young man, we bought a farm down in Otsego county. It was quite a hilly farm as many of the farms are in that county. There was one field that had not been very well cared for, and the grass was pretty well run out. We could not plow it so we wanted to keep it seeded down, and we wanted to get as much hay from it as possible. We bought hay from another farm and used it on that farm and made considerable manure, and drew that manure out on to this field as soon as it was made. We have a good deal of snow there sometimes, and that winter was one of the snowy winters. There were three or four feet of snow. The manure was drawn out and spread on that snow. The land was quite sloping, on one side, we did not have enough to cover the field over, and so we did not put any on this side hill, and four feet down the hill you could not see any change in the grass from the effects of the manure applied above, showing that it had not washed down to any extent. The field the year before did not cut a ton to the acre, but by this system of topdressing and then bushing it, as many of you farmers know, and then sowing plaster we got two and one-half tons of hay to the acre. Of course if the snow had gone off very quickly, with a flood, and washed the land badly you would have lost some of the manure. But it did not, and there came sunshiny days and the manure kept going down until it was absorbed by the soil, and we got the benefit of it. You need not think because you draw out the manure in the winter that you are necessarily going to lose it.

Ques. Suppose the ground is frozen quite deep?

Ans. If there is a good deal of snow on the ground the snow will draw the frost out so that the manure will be taken up by the surface.

I want to impress upon you, if you keep a cow, to feed her well, save all the droppings and get them on to the land; then remember that the soil should be in a good physical condition, thoroughly fined. A great many farmers in the state of New York when they go out to plow a field are in a great hurry. They want to turn over all they can and if they happen to hit a stone they have not time to back up, and the result is that when they get it plowed it is not half plowed. Then they drag it just a little and put the crop in, and wonder that they do not get a good crop. The thorough cultivation, thorough fining of the soil, is one of the great secrets of success. I always like to go up in Canada and certain sections of New York state and see how some of the farmers plow the land and cultivate it. If some of our Eastern farmers, and the New York farmers, would learn to do it in that way their farming operations would be more successful. When they go out to plow the land they strike a line that is just as straight as you can draw a line, and every furrow is plowed just so. The land is perfectly plowed when they get through, if they plow only an acre a day.

After the plowing they go on and cultivate it very thoroughly. The way that very many of those farmers do after they have turned over the greensward in the spring is to put a roller on and roll it down. They they go on with a harrow and fine the surface and then roll it again. We use a cutaway harrow, and some use a spring tooth harrow. It does not make much difference about the kind of harrow if it is only used in a way that fines the soil.

Just remember this one thing: The soil holds water, on the surfaces of the little lumps of dirt, and the finer they are the more water they will hold. When you have free water in the soil it is not good for the soil. You want the soil to hold the water, and if you can have it so fine that the little lumps are all broken up, it will hold double the amount of water it will if they are in pieces as large as the end of your thumb. The plant will get the moisture and take it up. But if the dirt is in lumps the air gets in and drives the water out and dries it up and the plant does not get food.

Ques. After the crop is planted, what about cultivation?

Ans. The more cultivation the better. I do not think it is possible to overdo it if it is done in an intelligent manner. The man who keeps his cultivator going before his corn or potatoes come up, and keeps the soil fine, breaks the capillary veins, will grow a crop though it is dry weather.

Ques. Do you think harrowing once in ten days prevents evaporation?

Ans. It would help. If it were harrowed every three or four days it would be better, because the crust that forms will be broken up. Just as soon as a crust forms, water is going out. You should keep a fine dust mulch. If the surface is fined in the beginning, and kept down with a smoothing harrow, and then a two horse cultivator is used to just break the surface, it can be done very cheaply, and I think it will pay in the corn crop.

## FORAGE CROPS FOR THE DAIRY.

By Edward B. Voorhees.

The growing of animal foods is particularly important at the present time. The various crops found to be suitable for soiling or dry forage will be considered from the following standpoints: Their usefulness in a system of continuous soiling; their adaptability for pasture and hay; and the advantage of their use in reducing the necessity for purchased feeds. Furthermore, a systematic growing of forage crops will result in obtaining a very much larger yield of food per acre, thus concentrating our efforts upon fewer acres, and permitting a larger number of animals. The soiling system, however, has the chief advantage, of course, of providing a continuous supply of succulent food for every day in the year. The growth of forage crops, therefore, is advantageous, even for the man whose practice is to pasture, because these crops will supplement shortages due to drouth, or inadequate supply of food due to the watery character of pastures during wet seasons.

The matter of the food in forage crops is also one which requires some study, owing to the variability of the crops, both in their content of dry matter, and in the proportion of the nutritious compounds contained in them. In the case of fine mill feeds, we have pretty full knowledge concerning their composition and nutritive value, and furthermore, the various mill products, as bran, middlings, etc., contain practically the same total amount of nutrients, varying only in the proportions and digestibility of each. In the case of green feeds, on the other hand, wide variations are likely to occur in the amounts of dry matter contained in them. For example, corn in the stage of maturity in which it would be most suitable for feeding, will contain 25 per cent of dry matter, whereas certain of the millets and other crops, very desirable for soiling, oftentimes contain as little as 10 per cent. The ton basis of comparison, therefore, which is the usual basis, is not as safe a one as in the case of dry feeds of the same general character. This point of variation in the case of different crops should be taken into consideration, together with that other important one, namely, the influence of the amount and proportion of the different nutrients. It is now well understood that those crops which belong to the cereal group, as corn, sorghum, millet, etc., are carbonaceous in their character, and feeding them exclusively, if such a practice is ever desirable, does not give best results, but is wasteful, while the feeding of leguminous crops, exclusively, would result in supplying a much larger proportion of protien than is necessary or even desirable, which is also wasteful. In other words, the two classes of crops would be more economically used together, than if either were used alone. This line of investigation has also proved valuable in showing the possibilities of intensive farm practice. It has been demonstrated that for the climate of New Jersey, crops may be so arranged as to furnish a continuous supply of green forage from May 1st to November 1st, and the yields have been sufficient to provide from one acre food enough for four cows for this period. This may not be possible in your shorter season, though I am satisfied that with a careful study of the adaptability of a number of these crops to your conditions, a very largely increased product may be obtained. The crops that have been found especially useful are discussed in the order of their use. The amount fed per day will range from fifty to as high as eighty pounds, depending upon the character of the forage, whether very watery or reasonably dry, and upon the supply; when a great abundance is obtainable, larger amounts are given at each feeding, though in all cases when the forage is very young, or in the beginning of the year, smaller amounts should be fed, in order to get the system of the animal adjusted to the more succulent product.

*Rye.* The first crop to be of service in the spring is rye, which is usually ready for feeding the last week in April, and may be continued through the first ten days of May. It matures very rapidly after the heads appear, and can be successfully used for a period of from ten to fourteen days, if seeded at different times, and cutting is begun before it comes in head. Where it is not practicable to practice soiling, the crops may be pastured. This method, while more wasteful, is less expensive than soiling. It is very important to have a pasture crop at that season, because coming before meadow pastures are ready.

The crop yields well on medium soils, though it responds profitably to good treatment. It is recommended that it be seeded thicker than when the crop is used for grain; from two to two and one-half bushels of seed may be used with advantage on good soils. The fertilizers should be rich in available phosphoric acid. A fertilizer containing:

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| Nitrogen .................. | 3 % |
| Phos. Acid .................. | 8 % |
| Potash .................... | 5 % |

may be applied at the time of seeding, at the rate of 200 to 300 pounds per acre. A top dressing of nitrate of soda in the spring, at the rate of 100 to 150 pounds per acre, is also an excellent practice, not only stimulating a more rapid growth, but increasing the content of nitrogen in the dry matter. When cut at its best stage, it is nitrogenous in its character, though it rapidly changes in this respect as it matures. On the average, the crop will contain about twenty-three per cent. of dry matter, and a yield of six tons per acre would furnish about one and one-half tons, with a nutritive ratio of 1:5, thus being in itself practically a balanced ration. It, however, cannot be fed as an exclusive ration, owing to its watery character.

*Wheat.* Wheat is also an excellent green forage, and ordinarily its use will immediately follow that of rye. It contains on the average a little more water than rye, though its dry matter is richer in nitrogen. The seeding and treatment may be the same as for rye, though on the same character of soil larger yields of rye than of wheat may be obtained because of the greater foraging power of the rye.

*Alfalfa.* Alfalfa is a perennial plant, and once well established will last a number of years, from four to ten, or more, depending upon the character of the soil, and the treatment of the plant in reference to manuring and method of cutting. It grows well on varying kinds of soil, providing the subsoil is open and porous; the most favorable is a rich, somewhat sandy loam, warm and friable, with a deep and loose or gravelly subsoil, well supplied with lime. A dense clay or hardpan subsoil is most unfavorable. Although a rich soil is preferable, alfalfa sometimes does well on poor, well-drained gravelly land. While the plant requires much water, it will not flourish where the ground is saturated or flooded. The soil should receive careful and thorough preparation—this is very important—in order to secure a full stand. If the subsoil is hard and compact, the subsoil plow should be used. For the climate of Maine, I should recommend experiments with the Turkestan variety.

The first cut of alfalfa should be made just before it blossoms. If left until in full bloom, the quality of the product is reduced; besides, the plants are injured, and subsequent crops are smaller. In good growing seasons the crop will reach the cutting stage in from four to five weeks. This crop is not only one of the most useful for soiling, but makes an excellent hay. The dry matter is very rich in protein, having a nutritive ratio of 1:4.3. As green forage or hay it serves an excellent purpose on a dairy farm, since its use will materially reduce the need for purchased feeds. In other words, alfalfa rations should include corn meal, or other starchy foods, thus enabling the feeder to more fully utilize the carbonaceous crops of the farm. Owing to its early development, its use for soiling follows in order the rye and wheat; the first cutting last year began on May 19th.

*Crimson Clover.* Crimson clover is one of the most useful of our forage crops from the standpoints of yield, composition and cost, and the ease with which it may be secured. It is essentially a catch crop. It may be seeded at the rate of twelve pounds per acre, in corn or after a crop of early potatoes, without interfering with regular rotations. In fact in New Jersey, corn and crimson clover crops have been obtained the same year on the same land, and for a number of years in succession, the corn and clover both improving in yield from year to year, without heavy additions of manures or fertilizers. It will, however, like all crops, make its best growth on good land. It serves also, where soiling is not practiced, as an excellent pasture, and may be also made into hay, though it is necessary that it should be cut before the seed matures, owing to the danger that might follow from the matured hulls forming a ball in the stomach.

The yields will range from eight to twelve tons per acre. It is more watery in its character than the crops already mentioned, as it is usually necessary to harvest it in its early stage of growth, particularly if used as a catch crop to be followed by corn. A yield of eight tons of crimson clover will furnish as much protein as is contained in one and one-half tons of wheat bran, and, because of this nitrogenous character, it may be fed profitably with corn meal. This crop is also highly nitrogenous in its character, the dry matter showing a nutritive ratio of 1 :4.1, and may serve as the alfalfa to reduce the need for purchased protein.

No difficulty has been experienced in securing a catch of crimson clover at the experiment farm, and, with few exceptions, the crop has withstood the winter well; in fact, during the winter of 1899-1900, it proved more hardy than red clover. It may be that in cases where failures are reported there is a deficiency of lime, or of the mineral elements, phosphoric acid and potash. It is the practice at the farm, when breaking up the sod for corn, to manure at the rate of eight tons per acre of an even mixture of ground bone, acid phosphate and muriate of potash, and the following years in the succession to apply 100 pounds per acre of a mixture of:

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| Acid phosphate | 75 lbs. |
| Ground bone | 10 lbs. |
| Muriate of potash | 15 lbs. |

*Red Clover, Alsike and Timothy.* Following the crimson clover, the red clover, or mixtures of red clover and alsike, or even red clover, alsike and timothy, are used, and mixed grasses of timothy, red-top and Kentucky blue grass. These mixed clovers or grasses are familiar to all, and their character and feeding value well understood. These are also nitrogenous in their character, and for this reason are superior to most other crops, and may be used from ten days to three weeks or a month, depending upon the character of the plant mixture; the clovers coming earlier, and those having a larger proportion of grass serving to supply the green forage as late as the first week in July.

The yield of these will average about six tons per acre, though they are influenced, as the others, by the character of soil and season, and the grasses, particularly, showing a higher content of dry matter than the clovers. On soils where soiling is practiced, it is usually a good plan to seed in the early fall, when the crop, if well fertilized, will be ready for use in the following summer. An application of 300 pounds per acre of a fertilizer containing:

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| Nitrogen .................. | 1.5% |
| Phosphoric acid (available) .. | 9.0% |
| Potash .................... | 5.0% |

is recommended.

*Oats and Canada Field Peas.* The various varieties of peas are sold under the general name of Canada field peas, and can be obtained from most dealers. The oats should be the stronger growing varieties, the Clydesdale giving excellent satisfaction. This crop is one of the most serviceable in a forage crop rotation, because supplying food when other crops are not usually available. The crop may be seeded at intervals of from a week to ten days, making them follow in the order of their maturity. Hence, the first crop should be seeded as early as possible in the spring; it requires about two months from time of seeding to time of harvesting. This crop is better adapted for mellow loamy soils than for light sandy soils, though good crops may be produced on the latter if seeded early. On good soils two bushels per acre of both peas and oats should be used. The peas may be sown immediately after plowing, while the land is still rough, and harrowed in or plowed shallow, and the oats then drilled in or sown upon the harrowed surface. First cuttings, which may be made just as the oats are heading, like the clovers may be used to advantage without the addition of feeds, though owing to their watery character it is better to add small quantities of fine feeds to the ration. The yields will range from six to ten tons per acre—with us the average at the farm has been about eight tons—and this yield will furnish about as much protein as is contained in two tons of wheat bran. Where manures are freely used, say eight to ten tons per acre, a good addition of fertilizer may consist of 200 pounds per acre of an even mixture of ground bone, acid phosphate and muriate of potash. The crop responds remarkably well to the application of manure previous to or at the time of seeding, the soluble nitrogen in the manure promoting an early, rapid growth of both plants, which is a very desirable characteristic. This crop also makes an excellent hay, and while more difficult to cure than most hay crops, is not more so than alfalfa or crimson clover. It is richer than ordinary hay in protein, and if cut when the oats are in the milk stage, and the peas just beginning to form pods, it makes an exceedingly palatable food. The plant may also be allowed to ripen, then threshed and the oats and peas ground, when an excellent feed will be produced. The straw also serves as a good bulky food. A yield of two to three tons per acre may be obtained of the hay, and from thirty to fifty bushels of the grain.

*Corn.* Following oats and peas, which may be usually fed until August, the early planting of corn will be ready. The corn crop is as a whole so well known that it is hardly necessary to discuss its merits in detail, except perhaps to emphasize the fact that if quick maturing crops are grown, two crops may be obtained in one season from the same land. One of the best varieties we have found for soiling purposes is the Thoroughbred White Flint, as it grows very rapidly and branches from the base, thus constantly getting thicker. The stalks are not so large and are succulent, and do not show so large a proportion of waste as is the case in some other of the larger growing varieties. It is advisable to plant it much thicker than is recommended for crops intended for silage. We usually plant in drills three and one-half feet apart, with plants from four to six inches apart in the drill. This is the first cultivated crop considered, though the extra cost is in part balanced by the cheapness of the seed.

For silage, no crop is superior to corn, and the larger growing varieties are recommended. At the Station, the Southern White has given the best results; it starts off vigorously ahead of the weeds and makes a large, rank growth, which ears well. It will mature for the silo, when planted after crimson clover, the last week in May or the first of June; when planted in drills three and one-half feet apart, and with the grain about ten inches apart in the drill, the yield will range from ten to eighteen tons per acre, containing twenty-five to twenty-eight per cent. of dry matter. Silage corn should not be cut until the ears are beginning to glaze, at which time it will usually contain the higher percentage of dry matter. If put in too green, the silage will not be so good and the losses due to fermentation will be greater.

The yield of corn, of course, will vary widely, ranging from eight to twenty tons per acre, though on medium soils and in a good season the average will not be far from ten tons per acre. This crop differs materially in its composition from those already discussed. It is carbonaceous in its character, the dry matter of the fodder, when cut at its best stage of soiling, showing a nutritive ratio of 1:11, or less than one-half as much protein in proportion as is contained in the clover crops.

*Sweet corn.* Many farmers believe that owing to the larger content of sugar contained in the larger growing varieties of sweet corn, this crop would serve better as green forage than the field varieties. Stowell's Evergreen Sweet was tested the past season, and the results were not as satisfactory as those obtained from the White Flint, for while the crop was eaten more completely than the larger varieties, as the Southern White, it was no more fully utilized than in the case of the White Flint, besides the growth is much slower, particularly in the early spring, and the yield of dry matter per acre was only about one-half as great as from the other varieties. For a crop that may be seeded in June for summer growth, it may be strongly recommended.

*Barnyard Millet.* Barnyard millet is much superior to the ordinary German millet or Hungarian grass. It may be sown after rye, oats and peas, or other crops at the rate of fifteen to twenty pounds of seed per acre, as early as May 15th, or as late as August 15th,—it will mature a crop in from forty to sixty days, depending on the season. If well fertilized, which is essential, the yield will range from eight to twelve tons per acre. In using this crop for either soiling purposes or for hay, it should be cut just before heading out, as it hardens very rapidly after heading, and is then unpalatable.

*Pearl Millet.* This is one of the best of the millets, and different seedings may be planted, beginning with May 15th, and continuing until August 15th. It is one of the larger varieties, growing from eight to ten feet high when in full head, forming stalks something like sorghum, though it is a very succulent fodder. It should be seeded at the rate of four to six quarts per acre on land well prepared, in order to encourage rapid and complete germination of all of the seeds. It is a very rapid grower and will make a crop in from forty to sixty days. The yield obtained at the farm averaged 12 tons per acre. It is much more watery in its character than corn even, thus making the yield of dry matter less than would be the case from the same yield of corn, though it is quite similar in its composition, showing a nutritive ratio of 1:12.

For soiling, cutting should begin before it is in head, since as it begins to head the stalks become hard and unpalatable. All of the millets are surface feeders, and should be well supplied with available fertilizing materials.

The broom corn variety of millet is also excellent for soiling purposes, and its treatment may be the same as for the barnyard and pearl varieties. Broom corn millet will require twenty to twenty-five pounds of seed per acre, and the barnyard millet sixteen to twenty pounds per acre. The seed should be evenly broadcasted on a surface well prepared and fertilized or manured with materials rich in available nitrogen. A good fertilizer is one containing:

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| Nitrogen | 5% |
| Available Phosphoric Acid | 6% |
| Potash | 5% |

*Kaffir Corn.* Kaffir corn is a crop quite similar in habits of growth to the larger varieties of millet, and, while more leafy, is, as a whole, less palatable. It grows in our climate from six to nine feet in height. It may be seeded in May, preferably in rows as corn, and cultivated; about ten pounds of seed is required per acre. The Kaffir corns have proved valuable in the southern and western sections of the country, owing to their drouth-resisting qualities, but cannot take the place of corn in this State. The yield obtained has been about one-half that obtained from good varieties of corn, though owing to the higher percentage of water contained in it, the yield of dry matter has been practically only one-third as great. Great claims are made for these plants in other states, as already intimated, yet thus far our experiments do not show that they can be verified here.

*Teosinte.* Teosinte is a plant that is very highly recommended, particularly by seedsmen, and does make an enormous yield. It, however, requires a whole season, thus making it less desirable as a forage than the quicker growing plants. It is also very slow to develop in the spring, making it more expensive to keep clean on land reasonably weedy, besides occupying the entire season. It is a succulent and palatable forage; in fact, so watery as to make it undesirable from the standpoint of food produced. In our experiment at the Station, when seeded at the same time and cut at the same time as corn, the dry matter in the Teosinte was 9.9 per cent., whereas that in the corn was 21 per cent., or, in other words, one ton of corn would furnish as much actual food as two tons of the teosinte.

*Sorghum.* Sorghum is another plant which belongs to the cereal family, and is also strongly recommended in some sections of the country, but where the other plants mentioned grow well, this cannot be recommended as superior. In the localities where the season is much longer, as in some of the southern and southwestern states, two or three crops are sometimes secured by cutting at early stages of growth, and allowing them to grow up again. This has been tried at the farm, and has not been found successful.

*Cow Pea.* This is a leguminous plant that possesses many desirable qualities as a forage, and the longer our experience with it as a forage, the more can be said in its favor. Of the numerous varieties the Clay, the Whippoorwill and Black are all well suited for soiling purposes. It is a crop the dry matter of which is exceedingly rich in nitrogen, possessing the advantage mentioned for the clovers in reducing the need for purchased protein. The plant will thrive well on light poor soils, if an abundance of mineral elements are provided, though their best results are obtained on a warm, good soil. Seed should not be sowed until the last week in May or first of June, or until danger of frost is passed, and because of their more rapid growth after the hot weather of summer sets in. In the experiments conducted in this State, they have been sown broadcast, though many recommend seeding in drills and cultivating as for corn. While this may be advisable on land that is very weedy, it has been our experience that the extra yield obtained from cultivation did not counterbalance the extra cost. They may be seeded, therefore, either broadcast or in drills. If broadcast, one and one-half bushels of seed should be used and well covered. If in drills, one bushel will be sufficient. The saving in seed is quite an item at the present time, owing to its high price. The yield will vary widely, depending upon both the season and the period of time they are allowed to grow. If allowed to grow throughout the entire summer, yields as high as sixteen tons may be obtained. If cut when they reach a good condition for soiling, from eight to twelve tons may be obtained. The cow pea, like alfalfa, is very rich in nitrogenous substance, and, therefore, is more valuable pound for pound of dry matter than the corn or millets in balancing rations for dairy cows. The nutritive ratio is about 1:4, thus requiring a very considerable addition of carbohydrates to balance. A yield of ten tons of green forage per acre will contain as much protein as about two tons of wheat bran. Cow peas may be successfully made into hay, though requiring extra care in the handling.

*Soy Beans.* This crop is quite similar to cow peas in its characteristics and habits of growth, and the recommendations as to seed, seeding and cultivation will apply equally well here. They are less palatable than the cow pea, owing to the hardness of the stem, which, as the plant grows older, becomes very woody. It also requires a little longer time to reach the right stage of maturity for use. Where cow peas can be successfully grown they possess all the advantages that would be obtained by the soy bean.

*Cow Peas and Kaffir Corn.* An interesting experiment was conducted the past year, using a combination of cow peas and Kaffir corn, the idea being that the Kaffir corn, being a strong, upright grower, would serve to hold up the cow peas, besides securing a larger yield because of the two varieties of plants. The experiment was successful insofar as this particular purpose was concerned, though owing to the very dry season the yield was not as great as could be expected under average conditions. This combination is also very palatable, and because of the different character of the two plants, the composition of the dry matter is such as to furnish practically a balanced ration, though, as suggested in reference to other forage crops of a watery character, it will not be altogether a desirable practice to use them exclusively. When these are seeded together, one bushel of cow peas and twelve pounds of Kaffir corn would be sufficient. This field is a fruitful one for the experimenter, as it is more than likely that other combinations would prove useful, as, for example, with field corn, etc.

*Barley and Peas.* This crop was very useful for late soiling. Its field management is practically identical with that of oats and peas; it is not injured by light frost, and can be fed throughout the month of October. If the weather is cool and moist throughout August and September, nearly as large yields may be obtained as from a crop of oats and peas, but if the fall is dry and hot, the crop is liable to be very much reduced.

As has been shown by the discussion of the various crops suitable for green forage, they differ in the actual tonnage that may be secured per acre, and in the amount and character of the food contained in them. Hence, it is important to have actual knowledge in reference to the relative yield of food and its cost.

The following table shows the average yield per acre in tons, as well as the amount of nutrients secured.

SOILING CROPS. NUMBER, KIND AND ACREAGE, 1901.

| Crop Rotation. | | | Nutrients. | | |
|---|---|---|---|---|---|
| No. of acre. | | Yield per acre. | Protein. | Ether extract. | Fiber and nitrogen-free extract. |
| | | Tons. | Lbs. | Lbs. | Lbs. |
| 1 | Oats and peas<br>Cow peas and kaffir corn | 18.4 | 991.5 | 216.0 | 4573.1 |
| 2 | Oats and peas<br>Cow peas and kaffir corn | 18.4 | 991.5 | 216.0 | 4573.1 |
| 3 | Wheat<br>Barnyard millet | 16.8 | 691.7 | 216.0 | 4573.1 |
| 4 | Wheat<br>Barnyard millet | 16.8 | 691.7 | 216.0 | 4573.1 |
| 5 | Rye<br>Soy beans<br>Barley | 21.0 | 1140.2 | 243.2 | 6734.1 |
| 6 | Rye<br>Cow peas<br>Barley | 22.7 | 1243.4 | 308.1 | 6435.2 |
| 7 | Oats and peas<br>Pearl millet | 13.3 | 642.5 | 122.2 | 3372.1 |
| 8 | Oats and peas<br>Pearl millet | 15.1 | 683.2 | 122.2 | 3866.4 |
| 9 | Alfalfa | 21.7 | 1803.3 | 384.1 | 7011.3 |
| 10 | White flint corn | 9.1 | 300.3 | 112.8 | 3011.2 |
| 11 | Oats and peas<br>Cow peas | 11.3 | 810.6 | 166.8 | 2280.8 |
| 12 | Rye<br>Sorghum | 18.7 | 624.7 | 199.2 | 5010.0 |
| 13 | Mixed grasses | 10.2 | 958.8 | 244.8 | 4284.0 |

## THE IMPORTANCE AND PROFIT OF GOOD CARE OF MILK AND CREAM.

By E. E. Light, Union.

All milk as it comes from healthy cows is of approximately perfect quality and capable of making a perfect article of sweet cream, butter or cheese if its surroundings and the influences to which it is exposed immediately after it leaves the udder of the cow, and until it passes from the care of the farmer, are correct. If it sours quickly, it is because the temperature was not promptly and sufficiently lowered. If immediately cooled to 40° F., lactic acid germs do not develop, and if bad flavors show, it is because filth and impurities have been admitted. Germs of life of many kinds, capable of producing a great variety of effects are not inherent in milk, but are always present in the air of stables, especially on the cow's udder, skin, hair, on the milker, in the corners of the milk pail, and in whatever place it is exposed. The admittance of these germs and their development in the milk while it is in the keeping of the farmer is the main cause of the cream souring and of the butter being low grade, and these things are mainly within the control of the "man behind the cow."

The score card, unintentionally, I presume, divides the qualities of butter equally between the farmer and the butter-maker. Grain 25—color 10—salting 10—general appearance 5—total 50. These points are wholly within the control of the butter-maker and due to his skill or neglect.

*Flavor 50.* Usually produced by influences that affected the milk or cream before it ever reached the control of the butter-maker. Recently we have learned how to counteract somewhat those influences, if bad, by killing the germs by heat, called "pasteurization," and introducing a new and desirable influence to develop the proper flavors called commercial "starters." This method is really a means of correcting the evil that has been done by the farmer, unwittingly, and too often unnecessarily.

No buttermaker can make a fine article of butter from old or injured cream. The milk was once all right, but somewhere from the cow to the factory it received germs, and its temperature was allowed to be such that they had wrought a change that seriously injured its value. The keeping qualities of milk and the continuance of cream in a sweet condition depend upon its purity and low temperature.

Market reports give several grades of butter with a difference between grades usually of one or two cents each. And according to the rule of the score card one-half of that difference is due to flavor—the farmer's part.

In associated work the difficulty is increased by the fact that even one negligent or slovenly patron may seriously counteract the best efforts of a score of others, because each composite lot of cream makes one lot of butter of a quality not much, if any, above that of the individual lot of cream in the churning that was poorest in quality. This shows the importance of each patron doing his work correctly, and also of insisting that every other patron associated with him should also do as well.

The farmer cannot enhance the value of milk, but he can do very much to preserve its normal quality and retain the value inherent in it. Mr. H. B. Gurler told us one year ago of the success of his certified milk business, which is accomplished wholly by having only clean, healthy cows, good food, good ventilation, clean milkers and utensils, and milk quickly cooled and held at a low temperature. No heat is used, no preservatives; just simply purity, cleanliness and low temperature.

Every farmer in Maine can apply these methods if he will, perhaps not to the extent that Mr. Gurler has, but to a point a great way in advance of present habits. The average farmer today is away behind the ideal conditions necessary to preserve the inherent qualities of milk and cream. Improvement has been made and is still going on, and the necessity for further improvement grows more apparent each year.

A milking room as clean as a kitchen, with air purified by the sun, and free from odors and dust, would be none too good in which to draw pure milk from a cow, in order to maintain that purity until its temperature is reduced to a point below the danger from obnoxious germs. A cow as well groomed and tidy as a driving horse would be none too clean to stand over a milk pail while yielding up a food already prepared for the nourishment of the strongest as well as the weakest of the human family, and a fluid that may yield a variety of food products the most valuable of the farm. To make an improvement in the quality and reputation of our dairy products we must try to approach these ideal conditions or else remove the milk from the unfavorable surroundings as soon as possible.

Prof. Gowell has urged for several years that cream should be collected oftener by our factories, that the creamery-man should get nearer the cow, which is right as far as it goes, and is practicable because it brings him nearer to the original purity of the milk.

Milk delivered and separated at the factories each morning approaches these requirements a day or two ahead of milk set at home and cream collected at intervals. But a fatal difficulty in that system lies in the sparse cow population in nearly all towns in Maine. Under any system of associated dairying, and especially under present conditions with us, there is a period during which the farmer has control and is responsible for the care of the milk and much of the value it may eventually yield; and nothing will quicken him in his duties so efficiently as the profit that will result from the effort required. When the average dairyman sees that by keeping his milk pure, clean and cold he adds to its value from ten to forty per cent. more than it would have brought if neglected, he will be neither slow nor unwilling to practice the methods essential to obtain it.

I am satisfied that Maine's success in associated dairying in the future will depend mainly on the superior quality of the product, and that the producer must be qualified for his part in the business as well as the operator.

The West will always outdo us in quantity, but they cannot excel us in quality if we try. Their distance from our markets adds cost and hazards quality. Our conditions are better adapted to private dairying in most of the states than to associated work, and it will continue to be in excess of factory work for a good while yet. But the standard will be set by the creameries, and as we have set the standard for sweet cream in New England we should strive to set it for butter also, so that the dairymen of Maine could point to "Dirigo" as their motto.

Our summer conditions for dairying are good if pains are taken in stabling cows nights, if cleanliness is observed, and if a liberal use of ice is practised. The long winter season is the time that needs the care and labor applied in the dairy to make it profitable and satisfactory. Nearly three-fourths of the year, stable care and feed in whole or in part, are required.

We have given much attention to foods and rations to reduce the cost of dairy products. We believe that more attention could profitably be applied to producing a better article out of what we have. Cleanliness in all the details and stages should be practiced. Sunlight should be utilized as far as possible, with both animals and utensils. Quick cooling and a low temperature of the milk and cream uniformly maintained are indispensable, in order that it may continue in its naturally pure condition until it has reached the consumer or the hands of the butter-maker who should be capable of making a high grade article from such stock, in order that we may command the highest prices, and secure the most profit, the best reputation and the greatest demand for our dairy products.

## CREAMERY PRACTICES.

By Geo. A. Smith, Geneva, N. Y.

An invitation to attend the annual meeting of the dairymen of your State and talk over modern dairy topics with you is a pleasure and an honor for which I wish to thank the officers of your association.

It is extremely doubtful whether I can say very much about the business that you do not know. The most I can hope for is that by bringing up some of the points that I believe are of vital importance in our business, I may be able to present them in such a way that you may get some new ideas which will help us to form a plan by which we may succeed better in competition with the western dairy farmer; if I do my visit may be of value to you.

If the older farmers here had been told twenty-five years ago that a majority of the commercial butter manufactured in the United States would be produced in what was then known as the far West, that the state having the largest number of milch cows would be situated west of the Mississippi river, they would have thought, and with good reason, that the persons making such statements were out of their heads. Still, such are the facts. Today Iowa has more cows than New York, which was for a long time the banner dairy state. Illinois and Wisconsin have made rapid strides, the latter state having about one million cows and some twenty-five hundred butter and cheese factories, being second to New York only in amount of cheese produced. These two states produce more than two-thirds of the cheese manufactured in the United States.

The idea that our fathers had that it required the hillside pastures with their nutritious grasses and spring water, "which were found so generally in New York and New England," to make good dairy products, has been found to be a fallacy. Minnesota has sent butter to Buffalo for exhibit at the Pan American and in the scoring it has shown up very finely, receiving as high marks as that from any state which exhibited, and this from a state in which a short time ago the farmers were raising wheat as their sole business. It was not proving profitable, as the annual yield was decreasing, and they were forced to take up some other line of farming. Stock keeping in some form appeared to be the only way and large numbers took up dairying. To-day they advertise it as the Bread and Butter State.

In the early history of commercial dairying the butter and cheese were made by the individual dairyman on his farm and the surplus product of the summer months packed and held for winter consumption. Had anyone advanced such an idea as milking cows and making butter and cheese in the winter he would have been deemed a fit subject for a lunatic asylum. With that limited production prices were fairly maintained and the dairy farmer made a little money. Today all this is changed. The wonderful increase in butter making all through the West and the consequent large production has brought about a corresponding decrease in price. The eastern farmer found there was no market for his held summer dairy butter. The western fresh made, the product quite largely of the new milch cows, came in to supply the market at the time he has usually marketed his surplus; it pleased the consumer so much better that there was no sale for the held dairy butter at a price that would make the business profitable for him. The consequence was he was driven out of business.

Large quantities of more uniform quality was the factor that built up the creamery system. Very many dairy farmers in different sections of the country are realizing that if they are to be factors in the dairy business of the country they must throw aside the prejudices of past generations and accept modern methods and ideas. The manufacturers of all classes of goods have found this true. Old fashioned machinery has had to be discarded if the manufacturer kept in the race. Competition is so strong today in nearly every line of business that the price is driven down to a point where the profit largely depends on geting a maximum production from each machine. It is practically the same with the dairyman. The cow is his machine and if she has not been bred in such a way as to make a large production of rich milk from the food consumed, he cannot compete with the other man who has the better cow. A good illustration of this was given in figures secured by the Model Dairy at the Pan American from May 1st to November 1st, the past season. As you probably know, there were ten breeds represented by five cows in each herd. The best cow of the fifty showed a profit over food cost of $59.40; this was for butter produced. The food cost was $29.16. The poorest cow had a credit of $11.49. The best herd, cost of food $136.99, net profit $220.37. The poorest herd, cost of food $132.32, net profit $111.96. The difference between cows of the same breed was nearly as striking. When we see figures like the foregoing I think it does not require any further explanation as to why some farmers say dairying does not pay. Here we had selection of animals, plenty of good food, good care and the best methods for taking care of the product and the results show a very narrow margin of profit with a part of the animals. You can readily see what the results would be with no selection, poor food and care and slack methods of manufacture. Often in talking with a farmer about the profit of his dairy, the only factor he will mention is price; he will quote such a year's prices, saying they were higher and it was profitable, while other years' prices were lower, and the balance was on the wrong side. He does not consider the important factor which he can control to a large extent, and that is cost of production, the one thing that every other manufacturer is studying all the time if he succeeds. The only safe proposition for the eastern dairyman to figure on is that prices for butter will not be high, but that good sound butter will bring a fair average price. One thing that he can depend on is that the western dairyman with his cheap grain is going to make all the butter he can, that he will have his cows come fresh in milk in the fall and make his largest production in the winter when prices are usually highest. Dairying in the west being a new business, it was comparatively easy to get the farmers of a neighborhood to work together. They had no previous knowledge of the business and were looking for instruction. The western experiment stations, realizing their needs, were making an especial point of working out problems that might help to make the business a greater success. The result of this co-operation is, that the western creamery in most instances has made a more pronounced success of the business than many of those in the older dairy sections. It is not to be wondered at that the new way of doing is not easily accepted by the dairyman brought up in the older dairy sections of the east. It has been a question of slow growth into accepted ways of doing. His forefathers kept a cow or two for the purpose of supplying milk and cream for the family and with no idea of making the milk a money crop. They lived largely within themselves, producing nearly everything they required on the farm. It was difficult for them to do differently, as the means of transportation were very limited, and if it had been otherwise there was no market available for any surplus they might have produced. Under this system they became accustomed to have the cows come fresh in spring and dry through the winter, packing the surplus in summer for winter use.

As time passed and there began to be a market for dairy goods, the farmer gradually increased the number of cows kept but he made no other changes. Men that have followed any line of business for a long time come to think that they know about all that is of any value about it, and when any radical change is proposed "and especially if it comes from scientific sources" they accept it guardedly and are slow to put it in practice. The farmer sees some work being done at the experiment station; from his standpoint it appears to be a failure and so he condemns station work, says it is of no value to the farmer. He fails to realize that we often learn more from failures than successes;

that doing a thing over many times and observing all the conditions is the only way we can learn the underlying principles which govern in plant growth, in dairy work and in all the different lines of agricultural science which should be of interest to the farmer. I do not know the per cent of farmers in your state that take the bulletins from the experiment station, but I hope a good proportion. In New York there are two experiment stations, one supported by the state and one by the United States government, both working for the 350,000 farmers of the state and publishing the results, which may be had for the asking. It would be a natural supposition that all those farmers would want that information, but the facts are that only about 50,000 of them take interest enough to ask for the bulletins. I do not wish to have you think that I am trying to carry the impression that taking the bulletins from the experiment station necessarily means that a farmer will succeed or not taking them that he will fail. Neither proposition would be true. What I wish to impress on your minds is that the same general truth holds good in agriculture and dairy farming that maintains in all other lines of business. The man that succeeds best is the one that has the best general knowledge of his business and studies to find and put in practice the best modern improvements and thus make a saving whenever possible. To illustrate this, a person is spoken of as being practical, which means that he is familiar with the manual labor connected with his business. When he studies the scientific side and becomes thoroughly familiar with it, when he starts to do a thing in a certain way, he is able to explain the reason why he expects to obtain certain results. A young man that has studied and has as good a theoretical knowledge of butter making as he can get from books, turned loose in a large creamery on a damp hot morning in August is liable to find there are some things he cannot learn in books about butter making. The same is true on the other side with the practical man. He finds conditions he cannot control and for which he cannot tell the reason, and consequently does not know how to meet them. The combination of good practical experience with a knowledge of why it is so is what gives best financial results. The question in the agricultural situation to-day is how to convince the ordinary farmer that the foregoing is true. He is not here today, he does not attend agricultural meetings and never takes the bulletins of the experiment station. If you met him and talked about the changed conditions in his business and the necessity of changing his methods to conform to the new order of things, keeping only the best cows, feeding better foods combined in a better way so that the cow would get just what she required, told him that the cow was a machine and a very delicate one too, that she could do her best only when she had the best raw material to manufacture milk and milk fat out of; he would simply look at you with unbelief pictured in his every feature and if he condescended to make any answer it would be to say that it was all nonsense to talk about there being any such difference in the quality of milk or in the ability of cows to make it as was claimed and that the people that were talking about it did not know anything about the business practically. There is too much of this feeling in many of the older dairy sections and it is very difficult to overcome. I heard the remark made by a gentleman of extended observation only a short time since that if a man's family surroundings were such that he affiliated with one of the political organizations and voted that ticket until he was thirty-five years old it usually took a political upheaval to change him and many times that would not. Many farmers are as set in their business management as most people are in their political affiliations.

One of the serious obstacles to the success of the farmers is a lack of co-operation and organization. We can readily understand why this is so. His work is isolated and does not bring him into contact with his neighbor as the work of most other laborers does, and with the result that he is not willing to accept the advice and counsel of others in the same line of business. The tendency of the times is toward combination. The professional men come together and discuss the different problems which they find. The manufacturers do the same and lately they have formed trusts in order that they may combine the best executive ability and so lessen expense. The basis of true prosperity in any line of work is that each individual engaged shall be reasonably successful. This can best be accomplished by organization and co-operation and a better understanding of what is required of the individual. The farmer that keeps one cow that only makes 125 pounds of butter in a year is one of the factors that is working against profitable dairying. I bring in this illustration to emphasize the point of cause and effect. You acknowledge that such a cow would cause you to lose money, but say that man's management has nothing to do with your business. Are you sure of this? If a certain market has a demand for 1,000 packages of butter and you crowd 50 packages more on to it, the result will be to lower the price, and all suffer by this overproduction caused largely by the keeping of those poor cows by unthinking farmers who charge their lack of success to nearly everything but the real cause. If all the farmers supplying that market were working and counseling together for mutual benefit and in that way were securing a small profit, a little overproduction would not be so hard to stand, but when quite a part of them are like our one cow man, then a little lowering of the price means hard times in that community, especially when the price to begin with is lower than the farmer can really afford. This is one reason why I say the farmers should counsel together and by doing it avoid as much as possible the many troubles which meet them in their business.

So far I have been talking about the machine, the man that operated it and the raw material that went into it. Perhaps I have taken too much time on this point, but one thing is sure; permanent success cannot be secured in any business unless established on a sound basis, and for that reason I have taken more time trying to enforce on your minds these points which I believe are of primary importance. When I was a young man at home on the farm, the milk was manufactured at home and we tried to do the work so well that we would get an equal price with our neighbors. This was an incentive to do as good work as we knew how. The great trouble was that our knowledge of underlying principles was practically nothing. We followed the rules and practices which had come down to us from our mothers and grandmothers. If the product was good, it was so because the conditions happened to be all right, if not, the witches were in the churn or some other equally bad thing. It was largely a question of "heads, I win." The how and the why were not thought of. Now it is all changed, thanks to a few men like Dr. Babcock, that were bound to know the why, and had the requisite training and tenacity of purpose to work out underlying principles. We are able to-day to largely control conditions, providing all concerned do their part in a reasonable way. The active cause of the trouble in the milk and cream that our grandmothers used to attribute to witches and at times put a heated horse shoe in the cream to drive out, has been found by those who were investigating these troubles to be very minute particles, usually making up in numbers what they lacked in size, but so active that the changes they are able to bring about seems at times almost incredible. If we had the faith of some of our forefathers it would not be a large stretch of imagination to attribute their work to witchcraft. These small plants, the lowest order of vegetable life being single celled plants, are termed bacteria, and in many ways are as important to us in our dairy work as is the highest order of vegetable life, "the grass" for feeding the cow.

If the question should be asked "What are the principal requisites for success in the manufacture of dairy products?" I should be obliged to answer, cleanliness first, last and all the time.

A neat, clean, tasty appearance goes a long way in securing a customer; then if the inside is clean and of good flavor there is not much danger but that the purchaser will be looking for your goods, and usually at a fair price. We often see an article written by some successful butter or cheese maker in which we are told that if we only ripen cream in a certain way or do so and so with the curd, we shall be sure to have a fancy product, and it was all true probably from the writer's standpoint, but might not apply in almost any other place. But if he had said that every farmer who furnished milk to his manufacturing plant was scrupulously clean and neat with everything pertaining to the milk he delivered and as a result he had no trouble in producing a first-class article, anyone that saw the statement, who was at all conversant with the handling of milk, would believe it to be true. It is one of the most difficult things in the whole business to convince most farmers that the quality of the goods depends to any great extent on the things that they may do or neglect to do in caring for their milk; that they must be extremely careful to see that the dust and cobwebs overhead and about the barn when the milking is done are kept swept down, to avoid affording a resting place for collections of bacteria to be stirred up by every gust of wind and dropped down on the animals and from there easily brushed into the milk to start it on the road to putrefaction; that the ventilation of the stable should be as near perfect as it can be made in order to remove the foul air and bad smells, so that the animal will be healthier from having pure air to breathe and the milk in better condition to make a first-class product. It is often quite difficult to impress upon a person who has not studied the subject, the difference between the effect of foul air and offensive smells which produce taint in the milk and the effect of the harmful bacteria which, though they make no smell at the time, bring about results which later ruin the product. A very good illustration of the latter is shown in a cheese difficulty we have been working with the past three seasons, trying to find what caused it and in that way to stop the damage. It is what is known as red spot in cheese and often causes quite a loss to the makers of white cheese, as the rust colored spot which develops in the body of the cheese constantly increases in size and gives a rather unwholesome appearance which the consumer does not enjoy, and if he purchases he will insist on a lower price. When we first began work on it Prof. Harding, the bacteriologist, took a little of the rusty spot and put it on culture plates and by making the conditions right, grew it and produced considerably more of the same color, showing that it was bacteria or something of that character that produced it. The trouble was to find the difficulty, as the spots did not begin to show until the cheese was several days old. One of the things done in trying to find the source was to take a quart of each farmer's milk and make a little cheese curd, tying it up in a piece of bandage cloth and allowing it to stand a few days and then examining it to see if the spot developed. In some it did, in others not, but the trouble was to find the cause in the places where it showed. The thing that we have done the past season and by doing controlled the trouble, is to enforce cleanliness as thoroughly as possible, both on the farm and at the factory. The method followed at the factory was to first clean thoroughly and then put everything movable that was used in the manufacture of the cheese into the large tin vat and cover with a heavy cloth and turn steam in and keep it going for one-half hour. The high temperature reached by keeping the vat tightly covered destroyed the rusty spot organism there at the time. By following this plan every two days for a time and then at longer intervals, the trouble has been controlled quite effectually. In one of the places where they had this difficulty they were able to control it to the extent that there was no loss for quite a time and they stopped the steaming. In a short time the trouble came back, but by returning to the steaming it was soon controlled, showing that plenty of hot steam and thorough cleanliness may be depended on to remove most troubles of that kind. In this case flavor was not affected. We sometimes have a case in butter making where the flavor appears very good when the work is completed, but word comes back when it reaches market that the flavor is not good. I have known of many such cases and have yet to find one that did not originate in a lack of cleanliness either in the creamery or at the dairy. Cans, pails and strainers imperfectly scalded are a fruitful source of bad flavors developing soon after the butter is made. The same thing often happens with cheese. One of the best lessons in the effect of bad odors on butter was given us at the Model Dairy at Buffalo the past summer. One day's milk was made into butter from each breed every week, and was judged as to flavor, texture, color, etc. One of the times when I went to judge it, I found quite a disagreeable flavor, worse in some than others. I asked the butter maker what the trouble was. He said he did not know. I thought I knew that everything was clean and as it turned out it was. I examined the churn and everything that was used and found nothing. The starter used was good and it appeared to be a hard question to solve. After coming out of the butter room, in going along by the cows, I noticed a smell that seemed to me to resemble the flavor in the butter. We began to investigate and found the herdsmen were spraying a mixture on the cows to keep off flies. Some of them used it quite freely at any time without paying the slightest attention to what the result might be. The butter showed plainly which ones used the most. This was a case that hot steam would not prevent, the fountain head must be cut off.

One other illustration along the line of effect of food may be of value in this connection. One of the successful butter makers of New York had a package of butter in the October exhibit. The score was not high,—ninety-five and one-half; he said "I do not see into that. A short time ago my butter was judged by a New York dealer at our county fair and received a mark of ninety-eight." I asked him if the conditions were the same. He said, "No they are better now. When the other butter was made the cows were on the old pasture; now they are up to their knees in clover after feed." That told the whole story,—too much fresh clover, producing a slightly fevered condition in the animal; result, milk not sound and a loss in flavor. The whole question on the farmer's side can be summed up in a few simple facts: A good cow properly fed and cared for; a good clean person to milk the cow, with a clean pail and everything in as perfect condition as it can be kept, no bad odors allowed. When these requisites are secured, the farmer has done his part to make the creamery succeed, but it will amount to very little if the man at the creamery does not do his part equally well. A man to succeed in a creamery must be a man of very good parts. To begin with, he must be a good judge of human nature and be able to manage people. There are very few places where more tact is required than on the milk receiving stand of a large creamery. The old saying "Many men of many minds, many people of many kinds" will be exemplified then if in any place in the world. If he has the ability to meet them in such a way that when a mess of milk comes that is not in good condition, he can explain the results to them so they will feel that he is not finding fault without reason but is working for their best interest and from it will be stimulated to use more care, the foundation is laid for a good product. But if back of that he has not the requisite training and knowledge of how to meet adverse conditions which are liable to develop, he will fail. This often comes as a result of some milk which was received that at the time did not show anything wrong, but which when heated produced conditions which required skillful handling to secure a product that will bring the top price. The most successful creamery that I know in New York, the one that secured the highest score in each exhibit at Buffalo the past season for that State, has been able to secure this record for the reason that it is conducted on sound business principles. The butter maker has shown by his past record that he thoroughly understood his business and had the necessary courage and tact to meet the farmers and induce them to furnish good clean milk as far as it could be determined when delivered, and at the same time keep their good-will and respect. One of the imperative rules is that all milk that does not appear clean and sweet and free from taint will be rejected. In a conversation I had with him a short time ago he said that he attributed quite a little of his success to the way in which he had cared for the starter used in the cream. He has been so thorough in its preparation each day that it has been carried over a year and is better at the present time than when first used.

In conclusion I think I may say with safety that you will agree with me that in the future it will not be possible to carry on the business of dairying in any such haphazard way as has been the rule in the past and hope for success. While there are very many things that we do not know, we are improving all the time and there is so much better knowledge of the laws which control animal nutrition and dairy bacteriology that the man who makes any really permanent success will be the one who has the best knowledge of and conforms most closely to those laws.

## DISCUSSION.

Ques. Do pasteurization and the use of a commercial starter interfere with the finer flavors of the butter that are produced with a good ripening process?

Ans. Pasteurization gives an even, smooth, sweet flavored butter but not a high flavor. If a man is going to make pasteurized butter, then, of all times, he must use one of the best starters he can get, and the butter must be well made. There is no way that you can get a higher flavor, a finer flavor, than with a cow on a June pasture, under good conditions, with perfect cleanliness. The only object of pasteurization is to destroy the bad effects of some one's uncleanliness. Where a creamery man is taking the milk from this man and that man and the other man, and one of those men will not do his work well, will not be clean, and still the butter maker does not reject his milk, pasteurization puts them all on a level, as it drives out the most of the germs that are really injurious.

Ques. Does pasteurization improve the keeping qualities?

Ans. Certainly it does, because you have reduced the bad germ contents of the butter. Pasteurized butter will undoubtedly hold its flavor longer, providing it is as well made as the other butter.

Ques. Is it any object for the Maine dairyman, who knows his business and is clean, to pasteurize?

Ans. It is not, for the man who is clean and keeps everything as it should be. Of course the majority of farmers think they are clean, and when you go at them as the New York Condensed Milk Company goes at them, they think it is a terrible thing. But what does it mean to be clean? In the first place, the farmer should go through the barn and sweep it thoroughly, getting out all the dust and cobwebs, and then go through it and spray it all over with a one-thousandth per cent solution of corrosive sublimate. That destroys the germs. Then he should whitewash it, and then he has a clean barn.

Ques. Is not there a limit to the time you can apply pasteurization to cream? That is, must it not be done before the cream has been kept until there begins to be a development of lactic acid?

Ans. That might be true. I believe that the majority of farmers, and the majority of creamery men, succeed better with pasteurization of milk than with pasteurization of cream. After the milk is pasteurized and the cream separated, the cream should be cooled down to fifty degrees and held at that low temperature for four or five hours, in order to solidify the butter fat, or you will get what is often found in pasteurized butter, a lack of body. That is caused almost entirely by the cream not being thoroughly cooled.

Ques. If cream has been carelessly handled, and injured in this way, will pasteurization remedy it?

Ans. It will, if it is not too bad. It can be helped very much by pasteurization.

Ques. Do you think it advisable for creameries in the State of Maine to pasteurize their cream?

Ans. I do not believe it would be if they could educate the farmers up to the point of having everything clean and neat, and all the conditions as they should be. But as long as some of the farmers will not do those things, for winter butter making, or winter cream making, it would be better to pasteurize. If you are going to pasteurize, however, you should learn how to do it, and do it right. Do not commence without any particular knowledge of it, but learn how to do it before you attempt it.

Ques. How long would it be practicable to hold cream that has been made under favorable circumstances and kept in proper condition?

Ans. I have known cream to be kept four weeks. I should not want to keep it much longer than that. Let me say right here that fresh cream never will suit the ice cream trade. Cream made to-day and put on to the market to-morrow or the next day, will not suit the consumers. There has to be a certain ripening process. For the table trade this is not necessary, but it is positively necessary for the ice cream trade.

Ques. In the instance which you mentioned, of the spraying mixture which was applied to the cows affecting the butter, was there a time when this might have been applied without affecting the milk or cream?

Ans. If the cows had been sprayed immediately after milking in the morning, the odor would all have gone away before the night's milking, and it would not have affected the milk. In the same way, some foods can be fed right after milking, and the digestive process goes on and it all passes out of the system so that you will not get the flavor in the next milking; whereas if they had been fed a little while before milking, the flavor would have been carried through the circulation and would get into the milk.

Ques. Will not the odors from the barn go directly into the milk?

Ans. If the temperature of the milk is down to the temperature of the atmosphere, they will, but while the gases are going out of the milk it is extremely doubtful whether it will take in any flavors. It is only a short time, however, before it does take them.

Mr. W. I. WHITE—I want to say just a word about the butter and cream conditions in Maine, as I found them this year. I have been down here several years, and each year I find something different,—a new situation. This year it is entirely new. You are stopping making butter and are making cream, and you are making very fine cream. I have seen a good deal of your cream, I am handling some Maine cream, and you are certainly making fine cream. I think Maine should be complimented upon the advancement she has made in the production of cream. If

I understand the situation, the creameries and farmers are more interested in producing cream than in producing butter. I do not think Maine makes fifty per cent of the butter she consumes. I am sending butter to Maine every day in the week, and certainly if you were producing it you would not send to Boston and buy Vermont or western butter.

I want to say something about the competition among the creameries, which is the whole cause of your trouble down here. The competition among the creamery men has made the farmers careless. There is hardly a man but has two or more teams going by his house, if he is anywhere near a creamery. If A will not take the cream standing in the barn, B will take it and go home congratulating himself because he got it away from A. That is bad for the reputation of Maine butter and Maine cream. If the creamery men would get together, and instead of rubbing backs shake hands and say, "You are just as good as I am and if you can get Tom Jones' milk, and pay him a little more, I am glad," it would be much better.

Ques. What percentage of pasteurized butter do you get in Boston?

Ans. We are getting very little of it. Of course the cream is mostly pasteurized, but we are getting very little pasteurized butter.

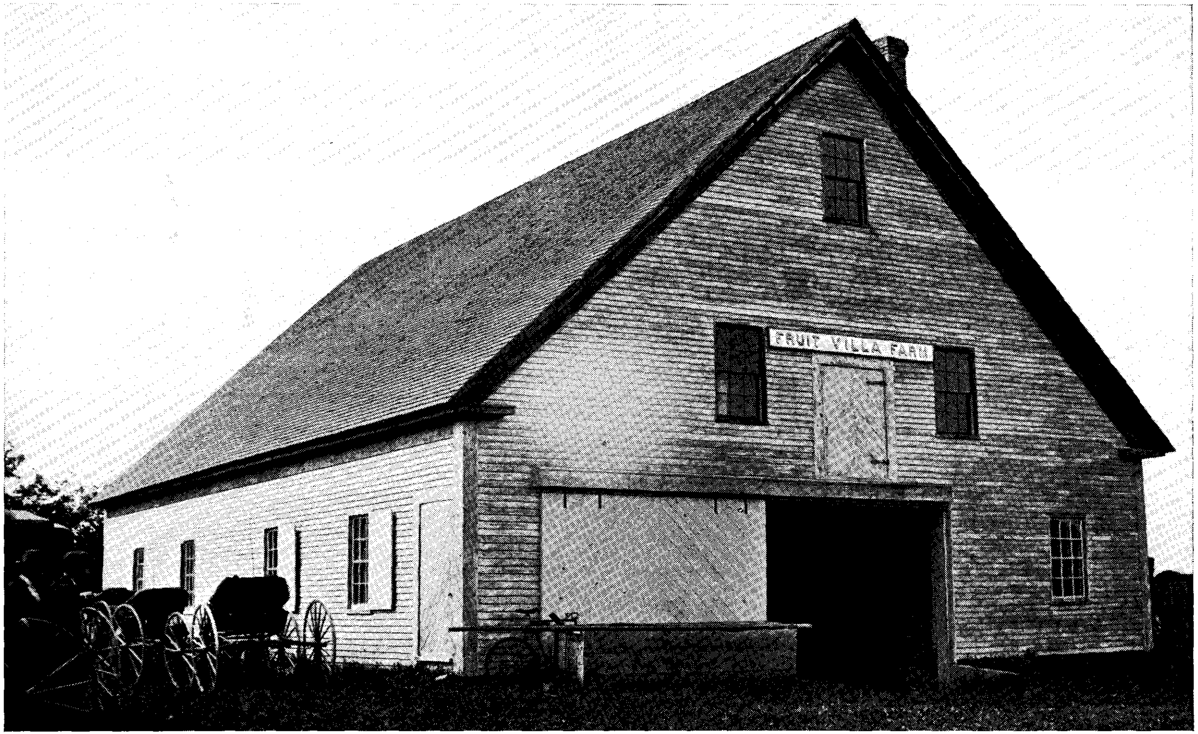
Prof. G. M. Gowell—I want to say a word regarding this work, because I think I fully appreciate the good words Brother Smith has said for us. He is sustaining the work we have been trying to do for so many years, and that is extremely gratifying. Last winter we got encouragement from Mr. Gurler relative to the cleanliness and proper handling of cows and milk. We had his testimony to the long keeping of the milk, long enough to be sent to Paris. When we apply his methods to the work on our farms of course we shall approach very near perfection, and under those conditions there can be no question but that we or any other state can make the highest class of butter. But that is too much to expect. We want to approach to it in a reasonable degree. Now, while I thoroughly believe in pasteurization, when we use it with good stock, I would not under any circumstances pasteurize stock for the sake of cleaning it from the filth that has fallen into it, but for the sake of removing the odors absorbed by it. With a good stock, I think we in the future must use pasteurization. On our farms we get a varying product, and it is brought to us all the way along that while we want a good quality, we want a uniformity in our stock, and pasteurization does give this. I am very sure that in the work we have done, when the pasteurization has been properly done, the cream properly cooled, we have got a firmer butter than from the unpasteurized stock. I most certainly hope we will not lost sight of the advantages from pasteurization and the use of a starter that is of high quality and uniform. We are doing a great deal of grand good work on the farms. We have a lot of experts,—private dairymen who have given the whole years of their life to that work, and we have also a lot of careless, indifferent people. The sloven is with us almost everywhere, but I do not believe we have more than are found in any other state. I believe we have advanced very much in our dairying. But we must come together and give the same thought to our butter making that the men who are handling the cream of the State are putting into that business. When we put the same skill into the production and handling of our cream for butter making purposes that the men who are shipping sweet cream put into it, when our butter makers put the same care and thought into the handling of cream for butter making that they are putting into the handling of that cream for the sale of sweet cream, we shall occupy a very high plain indeed. I believe the time is coming, and that within a very few years, when the butter making in our State is to be done by the use of pasteurized cream. We have failed to find any greater losses in the production and handling of cream and butter with the pasteurized than with the unpasteurized stock. Regarding the loss of those finer flavors, it is a matter about which I am very uncertain. Having the firm body that we get, and having conditions under our control, I query whether we have lost the delicacy of flavor of our butter or not, but if we can secure a greater uniformity perhaps we can afford to lose that.

## THE BUTTER BUSINESS.

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

(Stenographic Report.)

I believe my subect on the program is "The Butter Business" but I think I will permit my address to take a wider range than that. I presume it might more properly be called "The Dairy Business." If corn is King in this country, the cow is certainly Queen. The dairy business of the United States is a great business. There is no other branch of farming industry that is of more value to the United States than this. The cows of this country yield a product which every year is worth not less than five hundred million dollars. The gold and silver mines of the country do not produce as much in five years as the cows of the United States produce in one year. There are employed in handling these cattle, of which there are 16,000,000 dairy cows, millions of people, and behind the industry is more capital than there is behind all the national banks and all the railroads of the United States. Not only that, but this business is of such a nature that it is of great value to every class of people in this country. Everybody is friendly to the dairy farmer,—the lawyer, the merchant, the minister, the horse farmer, the hog farmer, and the farmer in every other line; everybody likes him except one limited class of people, the people that manufacture oleomargarine, and they are not popular. You find the business men of Wisconsin, of Minnesota, of Illinois, of Ohio, of New York, and of California all interested in the dairy farmer. Why? Because they know that the dairy farmer is the man who helps pay the lawyer his fee, the minister his salary, who builds up the business of the merchant. The dairy farmer is a man who does a cash business. If there is any class of farmers in the United States over whom there hangs no pall of death, it is the man who is following the cow around the most of the time. I do not mean to say that this is the only respectable and honorable farm business, by any means. Any kind of farm business that is intelli-




BARN OF PHINEAS WHITTIER, CHESTERVILLE.

gent is respectable, and is honorable if you make it so. What I do mean to say is this: The dairy business is of such a character that if a man continues in it he is compelled to be a business man. The trouble with the average farmer is that he gets along too easily. But the man who has to do business with the cow year after year is compelled to be a business man. He has to study animal life, he has to read, he comes in contact with the market, he has to do business 365 days in the year; and that develops a good, strong man. As you exercise your muscle, you develop it. As you exercise your mind, you develop that. I would not advise any man, young or old, to go into the dairy business, if he wants to have an easy time. The man who follows the cow has no primrose path to fortune, but he can get two years' work in one and usually he can get two years' profit in one.

At the risk of being personal, I will give a little of my experience in this business, for the reason that there may be some man here who will be stimulated to go into it, and I believe it has in it great possibilities of comfort and of wealth, at the end of a hard fight. I am not here in Maine for the purpose of telling you a lot of things you do not know. I do not expect to do that, I have too high an idea of your intelligence. I do not think we in Wisconsin begin to know all there is to be known about the dairy business, but I think some of us know some things about it and appreciate some of the advantages of it, when it is properly conducted, and if I can do a little good to any one man I shall feel that I am paid for coming.

When I was twenty-seven or twenty-eight years old I had two things,—poor health and $150 in money, or to be exact, $147. The money I had earned by teaching school. I thought it was a good time to get married. It took $100 for the wedding trip, and when I got back I bought one cow, a grade Jersey, and paid $40 for her, and went into the milk business. I had one customer who took five quarts a day. I started on a rented farm of 100 acres, six acres under the plow, paying $300 a year rent, and with an income of twenty-five cents a day. In six months I was selling 100 quarts of milk. I bought more cows, and for thirteen years I got up every day in the week, Sundays and all, at fifteen minutes of four and milked the cows, and worked during the day.

I kept that up until finally I had accumulated some money and had got pretty tired, and my wife said she thought we had better sell out and breathe for a little while. I went into that business with absolutely no previous knowledge of it. Although a farmer boy, I had never had my mind turned to dairying. If I could have had the advantages that men have now, in the dairy literature scattered all over this country, the reports of the dairy associations, the experiment stations and the agricultural boards, I could have saved myself years of hard, grinding labor. I wish I could impress upon every farmer in the State of Maine that he should save himself all the time and work he can by taking the experience of other men. I did not know a good dairy cow. After I had had one cow two years I found out that she was making two and one-half pounds of butter a week. After I had been in business for a while I found that there was just one kind of cows that would pay,—the very best kind I could buy. I would go into a yard and ask the man what he would take for one of his cows, and he would say, $30. I did not want her. I asked what he would take for another, and he said $60. "Pretty high price." "Yes, but that is the best cow I have." I took that cow, and she would average through the year ten or twelve quarts of milk a day, which meant sixty cents a day. The $30 cow would average about thirty or forty cents a day. The difference in the product of the two was $60 a year, twice the price of the cheaper cow, and the difference in the investment between $30 and $60 at seven per cent was $2.10. So I finally had it impressed upon me that the dairy farmer above all things should get a machine to work with that can do business. There is nothing on earth so disastrous to a man as to keep a boarding house for cheap cows that are running him in debt every day of the year. The men who make money in the dairy business, in my state, in your State, and in every state, are the men who go at it like business men, and who test their cows and find out what each particular animal is doing. You should not have any sentiment about it, and keep a cow simply because your father kept her or because she is good looking, or because somebody else says she is a good cow. Get right down to a commercial basis at once and test that animal, and see whether she pays or not, and if she does not pay, sell her to the butcher. It is the quickest way out of it. When a dairyman has done that, and has the kind of a cow that pays, he should then do the other things that the Professor told you so well about this morning. He should see that she is properly kept, that she is properly fed and properly watered, that her product is properly made, and then see that the product goes to the best market that can be found. Dairymen fail in different lines; one in getting his stock, another in feeding his stock, another in making up the product, and another in getting that product into the best market.

If there is any one thing I can do in New England that would do more good than any other, it would be to make the farmers think, and realize that they should take new knowledge. The farmers in this State and in every other state will have the standing in state and nation which belongs to them when they deserve it, when they are willing to know more, when they are willing to take knowledge from whatever source it comes, when they stand by the things which belong to them, when they stand by their agricultural colleges, their agricultural societies, their dairymen's associations, when they never forget their own interest in little quarrels among themselves. We hear farmers in many places, among many classes, spoken of with contempt. Why? Because they do not stand together. I do not believe in any Populist doctrine that we should have a farmers' party in this country. I do not believe that the farmers are better than any other class. I do not believe that we have in this class all the honesty there is on our green earth, by any means. But I do believe that the farmers of the United States constitute the foundation stone upon which this nation will stand in the years to come, that they are the rock of safety; that in the coming trouble, which will be a menace to our national life, the fight between capital and labor, the farmer will save us because he is a capitalist and he is a laborer, and he will never permit the capital of this country to crush the life out of labor because is a laborer himself. And so I want to urge the farmers to stand together.I want to say to them that all classes are to a great extent friendly to the man who is running this business of following the cow. When more people go into the dairy business there are less people engaged in other branches of farming, and those people are glad to have the dairy business built up because it means less competition for them. So the dairy farmer, in a general way, has the friendship of all classes in the community, and ought to have it.

I have learned one or two things by personal experience, which have been of value to me, and one is this: If you want to make the most money out of your cows you must study very carefully the individual make-up of each cow. A farmer or dairyman cannot do anything more stupid than to feed ten or fifteen cows the same ration. One of the greatest troubles with the dairy business is in getting hired help that will attend to it. You must educate your help in dairy lines, and have them study the make-up of different cows.

Another thing,—a cow is very much like a man in one respect, she does not like to be fed buckwheat cakes every morning in the year. She wants a little change. Nobody who takes care of poultry thinks of feeding them one ration day after day and week after week, but you will see pretty fair dairymen feeding their cows the same ration for four months. The only way the cows get even with them is by shrinking in their milk. I ran in debt a hundred dollars once for a lot of cows, and I tried all sorts of rations and feeds with them. I even got up nights to feed them. I finally discovered that by feeding a ration three or four weeks, for instance bran and corn meal, and then feeding two or three weeks with rye, bran and corn meal, then making a mixture of shorts, oat meal and a little corn meal, then oat meal and corn meal, and then taking some of these mixtures and putting in a little oil meal, I got very much better results than by feeding the same ration continuously. I learned another thing,—that while it may pay to let your horses go without currying, it does not pay with your cows. If you can get the kind of a man that I had described to me the other night, get him, no matter what you pay him; a man who will hang around the barn and look after the cows when he is not obliged to, who likes to go out and curry off the cows, and keep them clean and pet them. Do you know, a cow will sometimes give fifteen per cent more to one man, in the process of milking, than to another. It makes a great deal of difference who milks a cow, and if you have a large number of cows and several men, always have the same man milk the same cows. Surrounding conditions have a remarkable effect upon a cow. I once had a $200 cow that seemed to be all right. I took her milk up to the experiment station, and it tested 2.7 per cent. I took the milk up there again in a few days, and it tesed 4.1 per cent. There was something wrong about the conditions the first time. She was a high strung, nervous animal. There are a number of things about this dairy business that have to be considered carefully. The modern dairymen, who will put his mind into the business, is doing something which gives him mental exercise, which gives him mental satisfaction, and which brings to him that one thing that we are all after,—that is, the Almighty Dollar, and enough of them to keep him comfortable. A gentleman said to me the other day that the bright boys were all going West. Here in Maine I do not think that is true. It is undoubtedly an exaggeration, as I think it is true that there are a good many young men here in Maine upon farms who are bright and will make good farmers. In this matter of keeping boys upon the farms, that is always brought up in farmers' meetings, you must recollect that there is just one way to keep the boy there, and that is to make the farm pay. The boys can be kept upon the farms of this country, enough of them, if you can make those farms attractive, and if you can make them profitable, and that can be done. I have two boys, and one of them is in the University of Wisconsin, taking an engineering course, and the other is in Chicago college. It is the regret of my life that neither of those boys wanted to take up the business of farming, because it is an independent and an absolutely sure business, and any young man who will go at it and push it, and work, cannot fail, unless some calamity overtakes him, like sickness or something else entirely outside of human power. Look at the University of Wisconsin! We have built up an agricultural department, and pay $72,000 a year for the education of the young men of the state in agriculture. The dairy school has cost $65,000, the horticultural buildings $42,000, and a dairy barn $25,000. We have buildings amounting in value to over $200,000. At the last session of the legislature an appropriation was made of $150,000 to build another agricultural building. We simply have not room for the boys that are crowding in from twenty American states, to get an education. We have 100 boys in the dairy course. We had applications for 130, but thirty had to be turned away. We charge boys in the state only $15 for a term in the dairy course, and $5.00 in the short course, and we charge those from outside the state, because of our limited accommodations, $40 and $50 apiece, and yet they are knocking at the doors of that department all the time. Why is this? Because this business of intelligent farming has become profitable, because there is a demand for young men who know the theories and principles which underlie the great science and art of agriculture. I said to Prof. Henry before I came away, "Tell me about your school. I am going to Maine to talk to the Maine farmers a little." He said, "We have 400 students in the College of Agriculture. We had applications for 500 but were not able to take them. We shall be able to accommodate six or eight hundred when we get our new building." I asked him if he had any applications for these young men to go out into business. He said, "In the last year I have had 100 applications for butter makers and cheese makers, and 300 applications for young men to go out and take charge of large farming enterprises, take employment under men of wealth who have landed estates, and other lines of farming." You find the profession of law crowded, dentistry crowed, engineering crowded, every branch of human activity crowded to overflowing, and yet a demand for intelligence in young men in agriculture all over this country, from Maine to California, and down to Florida. We have sent two men to Vanderbilt and one to Hood, from the agricultural department of the University of Wisconsin. That kind of training and that kind of work in college education is the kind that pays. I want to say to the farmers of your State, build up here in Maine a system of agricultural training which will hold these boys on the farm and keep them from overcrowding other professions in life. I do not pretend to say that every boy ought to stay on the farm, not for a moment. I understand perfectly well that it is an idle thing to turn a boy against the natural bent of his character and taste and inclinations. I understand perfectly well that a boy can do his best only when he does those things which he likes to do. I want to see some of the boys go out from the farms and go into other professions. It is the boys who have been born and bred on the farm who are today the merchant princes, who are today running the railroads of the country, who are today running the governments of the states and the government of the United States. We want some of those boys to go out, but we want some of them to stay on the farm. Maine is not, perhaps, the most fertile state in the Union, you have not the most charming climate, I will admit, but at the same time it is good enough for any body. I am located in Wisconsin, my home associations and acquaintances are there, and yet I would not be a bit worried if I were compelled to come up here and buy a farm in the State of Maine, but that I would make a very good living and have a very good time. The boys in the State of Maine who are willing to make a study of this business of agriculture and fit themselves for it, will find soil enough, and room enough and opportunity enough to build up for themselves in this old State a comfortable and handsome business, either in dairying or in any other branch of farming.

I want to talk just a moment about the agricultural development of the State of Wisconsin. I have been dairy commissioner for seven years, and we have endeavored to make a complete list of the creameries and cheese factories in the state. We have about 1300 creameries and fifteen or sixteen hundred cheese factories. Our butter product is about 80,000,000 pounds a year, and we make about 60,000,000 pounds of cheese. We have absolutely revolutionized the business of dairying in that state by the work which has been done by the Experiment Station, by the agricultural societies, by the Dairymen's Association, and by the farmers' institutes. In 1887 we established the farmers' institutes in our state. At that time twenty per cent. of the butter of our state was first class and brought a first class price. Last year, out of the 80,000,000 pounds which were produced about 65,000,000 pounds were first class. The merchants all over the state in less than three years from the time we started the farmers' institute, were talking about the wonderful change which had been brought about among the farmers of Wisconsin. We simply went into every farm neighborhood, and we did not go to theorize, we took men who had made butter, men who had followed the plow, and we talked business right in their own homes. In the early years of the institutes a good many old men would come in and say it was all nonsense, a lot of book farming. But in later years those same old men would come into the meetings, and take part in the discussions, and give the benefit of their knowledge and advice. The curse of a farming community anywhere is that "Things are good enough." There is nothing good enough and there never will be anything good enough until the morning stars sing together. The people who are never satisfied are the people who do something for themselves and make improvement. What we want in our State and what you want in your State is more of this systematic agricultural education. We think we know a great deal in this country, we think we are far beyond foreign countries, but in some respects we are behind them. In Ireland 100,000 people are taught agriculture in the schools, systematically. Denmark, with 15,000 square miles of territory, a country that exports 130,000,000 pounds of butter a year, has twenty-eight schools in agriculture. Away up in Finland, towards the North Pole, with a territory larger than the State of Maine and only two millions of people, there are forty or fifty schools of agriculture. France spends a million dollars a year upon agricultural education in her schools. She does it not because she loves the farmer, but because it is French statesmanship to use this means of agricultural education to develop the agricultural resources of that country, and maintain the wealth and the independence of her people. Even in Russia, $600,000 a year is spent for agricultural education. We are taking it up in our State in another way. The last legislature passed a bill which provided that any county which desired to establish a county school of agriculture should receive each year not to exceed $2500 from the State for agricultural education. Two counties have already taken that up, and we are to have two county schools of agriculture which the boys living in the vicinity can attend at a small cost. It is also provided in the bill that each school shall have not less than three acres of land, upon which they can work out the things taught in the school. The county pays the balance of the bill. Before we get through, in all the leading counties we shall have these schools of agriculture, where dairying will be taught systematically, where horticulture, rotation of crops, and business methods of farming will be taught, and they will give to the boys of our state that intelligence and that love of the business which will keep the cream of those boys on the farms of Wisconsin.

There is another thing I want to mention in connection with the dairy business. We have a great fight on hand over the oleomargarine bill. One enemy of the cow is the man who does not take care of her, and feed her right, and the other enemy of the cow is the man who manufactures an imitation product and puts it upon the market colored in imitation of the product of the cow, where it is sold as and for butter. Now we have declared war against that business, and against that product in that form. I was in Washington four times last winter. I was a member of the National Dairy Union, who were trying to pass the Grout bill. That bill provided for a tax of ten cents per pound upon colored oleomargarine, and reduced the tax upon uncolored oleomargarine from two cents to one-half of one cent per pound. I attended a conference a short time ago, which was also attended by Mr. Knight of Chicago, secretary of the National Dairy Union, Governor Hoard, Mr. T. L. Haecker of Minnesota and others, and we agreed that the measure which we would push in this Congress should be introduced by Mr. James Tawney of Minnesota, and that we would take off the tax on the uncolored, and simply provide for a straight tax of ten cents on colored oleomargarine, made in imitation of yellow butter. That bill is undoubtedly before Congress now, and that is the bill which the dairymen of the United States will endeavor to pass. I have had a great deal of experience with these oleomargarine people in Wisconsin, during the seven years in which I have been in office. We have a law, as I think your State has, which absolutely prohibits the sale of oleomargarine colored in imitation of yellow butter. Every possible effort is made by the Chicago manufacturers to evade that law and force the product over our borders. I have arrested within the last few weeks one or two hotel keepers, one of whom was fined $100 for using oleomargarine upon his table. The way it is sold in some instances is this: The Chicago manufacturer sells his colored oleomargarine to the retailer for oleomargarine. The Wisconsin retailer, as a rule, sells it to his customers for what it is. But his customers in the main are people who are running hotels, boarding houses, lunch counters, etc. and they put it before their guests in response to calls for butter by people who do not want oleomargarine and do want butter. To illustrate the manner in which the law is evaded, I will give you a little experience. I found that oleomargarine was being shipped from Chicago to Milwaukee, and that a man went around the city and handed out blank postal cards, and about 200 people sent in their orders, direct to Chicago. The oleo would come by freight in boats and be delivered to these parties. Finally I induced one woman to make an additional order, which was filled by the agent, and I arrested him. I employed one of the district attorneys. The agent came up to see me, and admitted that the business was wrong and asked what he should do. I said, "Plead guilty. I will drop this prosecution if you will have a statement published in the papers that you will sell your teams and close up your business in three days."

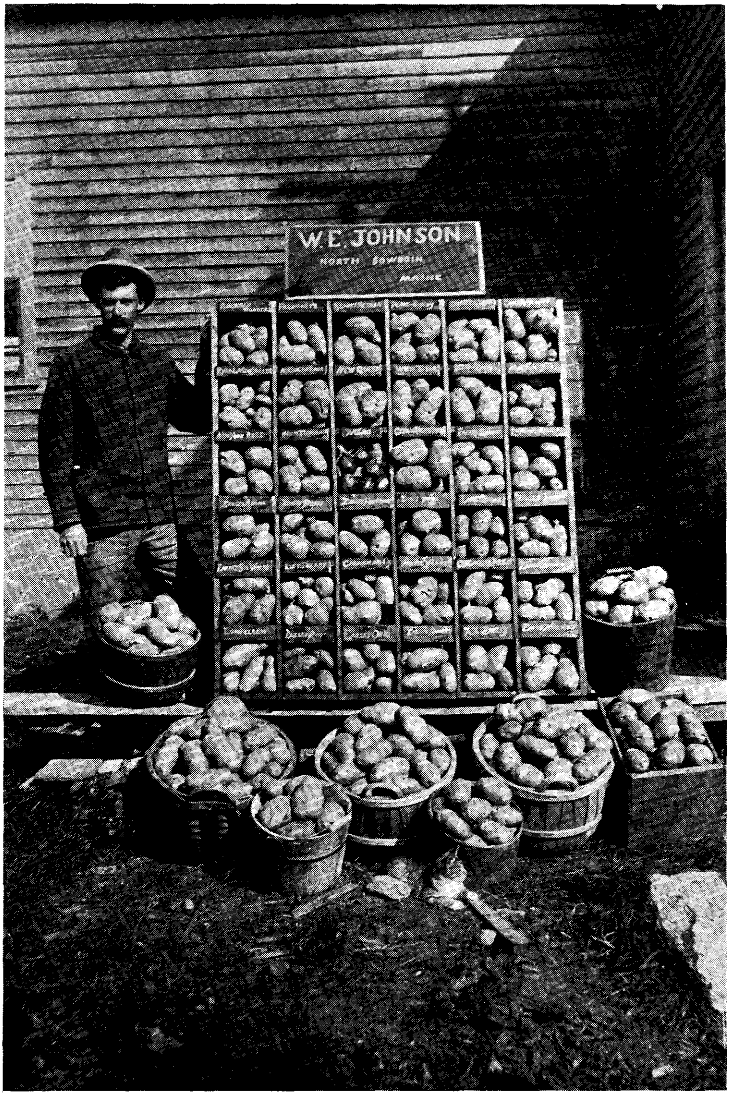
The oleomargarine people have been in the habit of saying to the merchants, "I want you to handle these goods." The merchants say it is against the law, but they are told that it is all right, they will be given a certified check of $100. When paying a butter price in ten stores, at eight stores they gave me oleomargarine. We took that down to Washington and placed it before the Congressional Committee to show that this business is permeated with fraud. We are charged with trying to crush out the oleomargarine business. That is absolutely untrue. We concede that oleomargarine uncolored, and under its own name, has the same rights in every market that butter has. But we say, and the supreme court of every state which has passed upon it,and the supreme court of the United States say, that when a man makes an imitation of yellow butter, and colors it like yellow butter so that the average consumer is likely to buy it for yellow butter, not wanting oleomargarine, the state and the United States have the right to put the heel of state and national law upon it, and crush that business out. All we are trying to do is to drive the fraud out of oleomargarine. You have no idea of the amount of work that was done during the last session of Congress to bring public sentiment to bear upon those politicians gathered under the dome in Washington. When I went down to Washington two years ago, in the interests of the bill, my friends said, "It is ridiculous for you to undertake to pass it. There is not one man in five in the House of Representatives that is for it." I said, "Wait until they hear from their people." We organized in Chicago, and raised $15,000, and sent 1,500,000 pieces of literature from one end of this country to the other. We flooded 350 congressional districts in the United States with that kind of literature. And when these gentlemen in the United States Senate and in the lower house began to get letters, postal cards and telegrams from men in business, and men on the farms, all over the United States, they began to wake up. I want to say to you that the representatives of New England stand by us, and you want to see to it that they are not only with us but that they are with us hard. Do not let them forget that you are on earth, that you are taking an interest in this legislation. We are going down to Congress, and take the testimony given before the last Congress, over 2,000 pages. We are going to put that before the gentlemen and say, "There is our case." We want to get this over to the Senate early. We got it there last year but it was late and enough senators stated that they would talk it to death so it was impossible to get a vote. We have taken away the tax upon the uncolored article. We have removed all objection on that score. We want the help of every Maine farmer and every business man to crowd that bill through. The competition that is honest is hard enough for the men who run this dairy business. The competition which is dishonest, the competition of an inferior product costing one-half what butter costs, is something from which we have a right to be relieved, and I believe we are going to be relieved of it by the present Congress.

Ques. What would be the proper way to bring these things to bear upon the representatives?

Ans. Write a letter yourself, and have your friends write, directly to your representatives. A letter is the most effective of all, it is worth any number of petitions. When a representative gets a letter direct from a man in his own district whom he knows, it usually receives some consideration. I want to say further in reference to this matter, that as Mr. Knight, secretary of our National Dairy Union, stated at our meeting, it takes a great deal of money. We do an immense amount of printing. Every time we send out a piece of literature to all of the names all over the United States, it costs the National Dairy Union $1500. The first thing received in that line was a check from the DeLaval Separator Company for $1000 and I want to give these people all the credit due them. In addition, we received $800 from the butter commission merchants of Chicago. We are going to publish a book, one chapter written by Gov. Hoard, another by Prof. Curtis of Iowa, another by Prof. Henry, another by Prof. Haecker. This book will be called "The Farmer's Hand Book," and will treat of dairying, cattle barns, rotation of crops, soils,—all those things which pertain to the farm. It will be an eminently practical work, of great value, and will be sold to farmers of the United States for fifty cents. We expect to make fifteen cents on a book, and use the profit in carrying on this fight against colored oleomargarine.

Ques. What do you think about coloring our butter?

Ans. Butter is colored to secure uniformity. It is not colored to resemble any other more valuable product. Oleomargarine is colored to imitate something which costs more and is worth more. Butter is colored to adapt itself to certain markets. In New England perhaps you demand as light colored butter as anywhere. Down in Louisiana they want a very highly colored butter. Butter coming in from different places, in order to secure a proper standing in the market and be easily handled and easily graded has to be colored a uniform color, but there is no deceit about it.




POTATOES GROWN BY W. E. JOHNSON, BOWDOIN.

## METHODS BEST ADAPTED TO PERFECT GRANULATION OF BUTTER.

By Prof. G. M. GOWELL, Orono.

I hardly know how to describe the best methods of securing granulation, because we are well aware that granulated butter is not a marketable product, it is simply a condition of the butter at one stage of the process of its manufacture. And I suppose every butter maker is familiar with the work and thoroughly understands how to secure granulation. We know, in the first place, that milk is composed of several substances, and the fat is in minute particles that float about in it; and it is those little fat globules that gradually accumulate and grow larger in the process of manufacture, that finally form the butter. When the cream is separated from the milk those fat globules come to the surface by the gravity process or are thrown off by the centrifugal process. When the cream is churned, two of them will stick together, then three, then four, and then one dozen, until finally those little globules, only about one-fifth of a thousandth of an inch in diameter gradually stick together and become large enough so we see them in the churn. They are very small yet, not large enough so we can make our butter from them without waste and make it in the best form. So we keep on churning until more unite, and when those get large enough so we can readily draw off the buttermilk, when they are about the size of number 8 shot, the work has been carried far enough. If we let them get larger than this they will lock up a certain amount of the milk serum, and that will have to be separated again in order to free them from the buttermilk. To stop the work when they are just the right size depends upon the skill of the butter maker. It is a simple matter when you know how to do it. We do our work in this way: We churn at such a temperature that we can form these granules in from forty to sixty minutes. I cannot tell you what the temperature is. From Holstein milk, Ayrshire milk, and the milk from many individual cows, the butter comes quicker than from Guernsey or Jersey milk, and other milk in which the butter fat is hard. The fat in the milk of the Holstein and some other breeds is soft, while in that of our butter breeds it is hard. Also different foods have an effect on the fat. Cottonseed meal gives us a hard, and corn meal a soft, fat. The rule is to experiment and find out at what temperature it is necessary to churn to have the butter come right and come within from forty to sixty minutes. Having determined that, you have the right temperature. Then, do not have the cream too thick. I would not have the cream contain more than 25 per cent. of fat, in order to have it in the best condition for securing granules. If it is thicker there is not liquid enough for the fat globules to float about and have room to form and finish. 35 per cent. cream is too rich. The little globules are so close together that in agitating the churn tney are liable to attach themselves and become large and of different sizes. We want bath enough for them to float about in. It is perfectly safe to use the cream from the gravity cans, as it will not contain 25 per cent of fat, but do not make the cream from the separator too rich, or it will be too dense for finishing the globules in the best form.

Ques. Do you not regard Cooley cream as a little too thin?

Ans. It is owing to the conditions under which it is raised. At 15 per cent. it is rather thin, but this does not interfere with securing good granulation. I think the ordinary 18 or 20 per cent. cream is all right for getting good granules, and we have no difficulty in using separator cream at 25 per cent. At 30 per cent. we *can* get good granules, but it requies more care. If we find that 60 degrees is the right temperature, we use that. If it is Holstein milk we may have to churn at 55 degrees or a little above 50, especially if the cows are fed on corn meal and silage. If we are using cream from Jersey cows that have been fed considerable cottonseed meal, we sometimes have to churn up to 70 in order to get the butter to come right.

When the granules begin to appear, look into your churn, and if you are a novice you will look quite often. As you continue to churn you gradually become accustomed to the business, and you know about how much churning to give it each time. Sometimes the granules will grow in size very rapidly, especially if the temperature is a little high, or the fat a little soft. When the granules are of about the right size, about the size of No. 8 shot, if we have three or four pails of cream we put in one pail of brine. The brine is made by taking an ordinary pail of water and putting in about a cupful of salt, and thoroughly dissolving it. We try to have the brine about two degrees colder than the temperature of the cream when we began to churn. If we churn at 60 degrees we add the brine at 58. Why we are so careful is this: We have gotten those little granules to the right size, and we want to finish them. If we continue to revolve the churn without adding the bath we shall soon stick them together, but if we add water a little cooler than the cream we tend to cool them. Then if we add the salt we have a denser bath, and they are more inclined to float, and by agitating the churn a few times they do not stick to each other but rub against each other in this colder bath and commence to round off. And as they float there and the churn is revolved, you have round balls, like round, hard shot. If you have added the bath too cold, they will finish too quickly and the outer corners are liable to break off and you have bits of fat floating around which you will be liable to lose. If they are not quite large enough at the time you add the bath, and too cold a bath is added, it is with difficulty that you can increase the size.

Some of the granules shown here today are of just about the right size, they are round and well finished. Some of the butter-makers evidently added the bath too soon, and the granules are not as large as mustard seed. They are very uniform but they are very small. They had a uniform granulation, but they stopped the churn too soon. Why is not that size just as good? You cannot draw out the buttermilk from among those small granules, because they lie so close together that they hold it by attraction. If they are larger, the buttermilk will run out. Also if the granules are too small the water cannot run out readily. It runs out slowly, and if you continue to make those granules into butter, you will have butter that is water logged or soggy. The butter will contain too much moisture, which cannot be gotten rid of without excessive working. Some machinery agents will claim that their machines are better because of the greater churnability. Every butter-maker knows that it is possible to lock in twenty per cent. of water. I have locked twenty-three per cent. into the butter. It is not difficult at all. Simply wash the butter when the granules are small, with as cold water as you can possibly use. This will cause it to hold a great deal of moisture. But we must not do this way, because the butter will begin to leak when it comes into a warm room. That brine tastes good, but it is not what the consumer wants to pay for. That butter is not wanted, it is not a perfect granulation. If you do not churn enough, you leave the granules with rough surfaces, and those tend to hold the moisture, to hold the buttermilk, or the casein, and it is that casein which gives us our sour butter when it is not very old. The casein begins to decompose, and affects the flavor of the butter when it is only a few days old. We must finish the surfaces of those granules, get them round, firm and hard, so that they will not contain much water. In the old way, when we had a solid mass it was taken out and put on the worker and then water applied, and we had to tear it apart and wash it to wash out the buttermilk. When we have these granules of the size we desire, we take the butter out on the worker and gradually work it, not for the purpose of salting it, because we added the salt in the churn after it was washed, not for the purpose of getting the water out, because the water drained out from among these globules before. We work it to give it a waxy consistency, to make it tough and wax-like, and then we have perfect butter.

Ques. What do you think of feeding gluten for butter making, with cotton seed, shorts and corn meal?

Ans. There is no reason why you should not feed it. Gluten has the same characteristics that corn meal has, only more intensified. It gives us a softer butter, even, than corn meal alone. It has a very good flavor and is a desirable food to use for butter making. It is cheap, it is safe. It is a clean product of the corn. At present prices of ordinary farm foods, if I needed a food that contained protein I would drop off corn meal and feed gluten because it is cheaper and richer in protein than corn meal.

Ques. It there any difference in the value of the different brands of gluten?

Ans. Some are better than others. Those that analyze the highest in protein are the most economical for us to buy. In our ordinary feeding, the Chicago gluten has been very satisfactory. The differences in the brands change somewhat from year to year.

I would simply be guided by the tags, which give the percentage of protein and fat contained. These tags are the means that the farmer has of educating himself regarding cattle feeding. He has a guarantee of the composition of the food he is using, which costs him nothing. People are complaining a great deal about the price of the tags on the grain. They think the farmer is robbed. But if they realized that when they buy grain with this tag on it they have a guarantee of the composition of the food, which shows them the food nutrients which the different brands contain, they would see that it may be a great saving to them. This was brought home to me very forcibly down in Damariscotta. We were talking about cattle feeding and in the evening a man brought in a tag which was attached to the corn and oat feed. I learned that the farmers were using that feed and no other, and they were paying $14 a ton for food actually worth $10. They could not buy cottonseed there because there was none for sale. But they could have gotten the same nutrients in cottonseed meal and corn meal for $1.00, for which they were paying $2.00 in the feed they were buying. Every single determination, three of them on each package, would have cost them $5.00, if they had had the food analyzed, and yet they were finding fault with the experiment station for making them pay for those tags. They ignore all these facts, and find fault with the conditions that are put in the hands of the farmers for educating themselves.

Sec. B. W. McKEEN.—This is, as we all understand, the last dairy meeting that will be held under the auspices of the Maine Board of Agriculture. For nearly fifty years the Board of Agriculture has been doing its work in our State, how well of course results alone will prove. That great advances have been made during those fifty years along lines relating to agriculture, no one will dispute. That there have been mistakes made, no one will deny; but I believe, and I think no one will question it, that the general trend has been upward, all the while upward, that this very important matter of agricultural education, which has been mentioned here so well this afternoon by both the speakers, has had at all times and under all circumstances a faithful and consistent ally in the Maine Board of Agriculture. I regret exceedingly certain conditions that exist in our State in relation to the creating of a sentiment favoring agricultural education. I picked up a paper in a grange hall not long since, known as an agricultural paper. One of the first things that struck my eye was an editorial note in the paper. This note stated that to prove that agricultural education was not foreign to all of our colleges of agriculture and the mechanic arts we had only to go to one of the western states for example. In that state, it said, they have at least eighteen to twenty-five professors engaged in lines directly relating to agriculture, and it went on to mention the various branches of agricultural science being taught there, utterly ignoring the fact that right here in the geographical center of our own State there was an institution that had been broadened into a university in which there existed a college of agriculture that was equipped as well or better than any other college of the same nature in this broad land of ours. As long as these little matters are circulating among our people, in a way that incidentally and perhaps silently tends to undermine the work that is being done that shall advance the agricultural education of our young men and of our older men, I say that our agricultural educators are placed at a very great disadvantage and something should be done to in some way overcome this tendency in the minds of our people to belittle the work that has been done along the lines indicated by Prof. Gowell this afternoon. I certainly hope for the time when there shall be a united effort on the part of every man, woman and child in the State in favor of agricultural education, of education along agricultural lines and by those of our people who are directly interested and capable of giving that education, when it will be impossible for us to find unkind, unnecessary and untrue censure of our agricultural college or of any of the other means that are being taken to educate and elevate our farmers. I believe that the work of those who have come into our State from abroad, like Mr. Adams, Mr. Smith, Gov. Hoard and others, has tended very much indeed to give to our people literary advantages, has shown to them what the sentiment of the people in other sections of our country is along these lines. I certainly hope, and I believe, that these meetings will be continued, and carried along on the line which has been pursued for so many years, and I believe so successfully, by the Maine Board of Agriculture.

# 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. Clark | 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. |
| Maine State Poultry and Pet Stock Association | Chas. L. Cushman | Auburn | Geo. P. Coffin | Freeport | H. C. Day | Auburn. |
| Androscoggin County | J. L. Cummings | Livermore Falls. | J. L. Lowell | Auburn. | I. B. Clary | Livermore Falls. |
| Androscoggin, Durham | Rufus Parker | Durham | J. H. Williams | Auburn | S. B. Libby. | Durham. |
| Aroostook County. | E. L. Cleveland | Houlton | Geo. T. Holyoke | Houlton | T. J. Fox | 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. | | |
| Aroostook, Madawaska | Eloi Albert | Up'r Madawaska. | Remi A. Daigle | St. David | Alexis R. Cyr | St. David. |
| Cumberland County | Alonzo Libby | Westbrook | E. H. Smith | Westbrook | F. D. Scamman | 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 | Woodfords R. F. D. |
| 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 | F. R. Rounds | Danville Junct | F. M. Nevens | New Gloucester | Geo. C. Jordan | New 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 | J. H. Patten | Amherst | J. H. Patten | Amherst. |
| Hancock County Fair Association. | H. E. Davis | Ellsworth | H. F. Whitcomb | Ellsworth | H. J. Joy | Ellsworth. |
| Hancock, Eden | A. S. Bunker | West Eden | W. L. Alley | Eden | Ephriam Alley | Eden. |
| Kennebec County | E. J. Gilman | Mt. Vernon | W. G. Hunton | Readfield | C. H. Stevens | Readfield. |
| Kennebec, South | C. F. Achorn | Cooper's Mills | A. N. Douglass | Gardiner, R.F.D.4 | J. S. Gray | South Windsor. |
| Kennebec, Pittston Agricultural and Trotting Park Association | J. H. Bailey | East Pittston | A. E. Marson | East Pittston | C. C. Libby. | East Pittston. |
| Knox, North | E. E. Thurston | Union | Geo. C. Hawes | Union | H. W. Grinnell | Union. |
| Lincoln County | A. M. Card | Alna | B. A. Woodbridge | North Newcastle. | John E. Nelson | Alna. |
| Lincoln, Bristol | Gilbert B. Curtis. | Walpole | 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 | L. A. Hall | Bethel | E. C. Rowe | Bethel. |
| Oxford, West | C. W. Pike | Fryeburg | T. L. Eastman | Fryeburg | W. R. Tarbox | Fryeburg. |
| Oxford, Androscoggin Valley | J. W. Thompson. | Canton | H. T. Tirrell | Canton | D. W. Goding | East Peru. |
| Oxford, North | George O. Huse | Andover | J. F. Talbot | Andover | Owen P. Lovejoy | Andover. |

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| Penobscot, Lee Union | Ira Barnes | Lee | Nathan Averill | Lee | 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, County. | W. E. Parsons | Foxcroft | H. K. Dinsmore | Foxcroft | C. C. Dunham | Foxcroft. |
| Sagadahoc County | H. J. Given | Brunswick | Robert W. Carr | Bowdoinham | 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 | Geo. F. Charles | Madison. |
| Somerset, East | C. K. Fuller | Hartland | J. A. Goodrich | Hartland | Chas. Rowell | Hartland. |
| Somerset, Central | S. W. Gould | Skowhegan | R. T. Patten | Skowhegan | E. D. Packard | Skowhegan. |
| Somerset, Bingham | Amon Baker | Bingham | John Redmond | Bingham | Edmund E. Hill | Bingham. |
| Waldo County | D. L. Pitcher | Belfast | B. H. Conant | Belfast | G. G. Abbott | Belfast. |
| Waldo and Penobscot | W. B. F. Twombly | Monroe | F. H. Bowden | Monroe. | F. L. Palmer | Monroe. |
| Waldo, North | W. H. J. Moulton. | Unity | E. B. Hunt | Unity | Edwin Rand | Unity. |
| Washington County | S. P. Bucknam | West Pembroke | Sidney A. Wilder | West Pembroke | Clifton Laughlin. | Pembroke. |
| Washington, West | B. F. Willey | Cherryfield | E. F. Allen | Columbia Falls | Willis H. Allen | Columbia Falls. |
| York, Shapleigh and Acton | Frank C. Staples. | Shapleigh | 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 |

## 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 | 58 | 22 | 48 | - | 68 | 74 | 26 | 60 | 210 | 8 | 16 | 116 |
| Androscoggin, Durham | 20 | 4 | 3 | 7 | 27 | 18 | 4 | 2 | 65 | 14 | 9 | 17 |
| Aroostook County | 72 | 30 | 74 | 5 | 32 | - | - | 12 | 153 | 43 | 11 | 19 |
| Aroostook, North | 58 | 18 | 25 | 6 | 15 | 6 | - | 12 | 82 | 31 | 2 | 33 |
| Aroostook, Madawaska | 26 | 4 | 5 | 1 | 8 | 13 | 2 | 14 | 47 | 18 | - | - |
| Cumberland County | 53 | 17 | 30 | - | 38 | 50 | 20 | 20 | 150 | 75 | 30 | 80 |
| Cumberland, North | 25 | 4 | 21 | 3 | 63 | 48 | 8 | 30 | 177 | 7 | 22 | 15 |
| Cumberland Farmers' Club | 14 | 7 | 20 | - | 21 | 42 | 5 | 20 | 109 | - | 9 | 96 |
| Cumberland Gray Park Association | 20 | 3 | 13 | 2 | 29 | 72 | 2 | 37 | 158 | 9 | 10 | 20 |
| Cumberland, Bridgton Farmers' and Mechanics' Asso. | 31 | 9 | 25 | 4 | 20 | 46 | 8 | 8 | 120 | 31 | 2 | 23 |
| Cumberland, New Gloucester and Danville | 18 | 4 | 7 | 2 | 42 | 18 | 2 | 10 | 85 | 7 | 9 | 66 |
| Cumberland, Lake View Park | 8 | - | - | 4 | 36 | 16 | 4 | 8 | 68 | 6 | - | 7 |
| Franklin County | 98 | 21 | 47 | 17 | 103 | 108 | 19 | 96 | 411 | 156 | 25 | 79 |
| Franklin, North | 40 | 13 | 34 | 6 | 65 | 108 | 12 | 24 | 262 | 61 | 83 | 30 |
| Hancock County | 12 | 3 | 2 | 7 | 31 | 16 | 4 | - | 63 | 8 | 29 | 4 |
| Hancock, North | 18 | - | - | 3 | 16 | 12 | - | - | 31 | 8 | 2 | 12 |
| Hancock County Fair Association | 30 | 10 | 12 | - | 33 | 12 | - | - | 67 | 16 | 12 | 36 |
| Hancock, Eden | 3 | - | - | 4 | 14 | - | - | - | 18 | 4 | 11 | 10 |
| Kennebec County | 92 | 14 | 35 | - | 57 | 104 | 42 | 58 | 310 | 35 | 42 | 65 |
| Kennebec, South | 19 | 6 | 20 | 9 | 38 | 100 | 4 | 25 | 202 | 23 | 18 | 17 |
| Kennebec, Pittston Agricultural & Trotting Park Asso. | 15 | 5 | 10 | 6 | 20 | 40 | 15 | - | 96 | 12 | 10 | 12 |
| Knox, North | 34 | 5 | 13 | 13 | 45 | 68 | 10 | 44 | 148 | 41 | 27 | 49 |
| Lincoln County | 17 | 10 | 21 | 12 | 16 | 140 | 3 | 26 | 228 | 20 | 27 | 30 |
| Lincoln, Bristol | 27 | - | 2 | 1 | 14 | 34 | - | - | 51 | 11 | - | 14 |
| Oxford County | 41 | 31 | 42 | - | 117 | 106 | 6 | 48 | 350 | 111 | 72 | 45 |
| Oxford, Riverside Park Association | 24 | 4 | 20 | 4 | 32 | 22 | 2 | 24 | 106 | 20 | 10 | 6 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxford, West | 61 | 11 | 39 | - | 9 | 136 | 14 | 28 | 237 | 28 | 33 | 39 |
| Oxford, Androscoggin Valley | 27 | 5 | - | 6 | 13 | 96 | 4 | 4 | 128 | 15 | - | 17 |
| Oxford, North | 10 | 2 | 14 | 2 | 7 | 10 | 2 | 6 | 43 | 38 | 19 | 19 |
| Penobscot, Lee Union | 17 | 6 | 8 | 12 | 16 | 6 | - | - | 48 | 8 | 4 | - |
| Penobscot, West | 58 | 21 | 86 | 9 | 70 | 72 | 3 | 36 | 297 | 41 | 19 | 20 |
| Penobscot, North | 30 | 6 | 8 | 4 | 18 | 20 | - | 30 | 86 | - | 6 | 5 |
| Penobscot, East Eddington Farmers' Club | - | - | - | - | - | - | - | - | - | - | - | - |
| Penobscot, Orrington | 9 | - | - | 3 | 10 | - | - | 4 | 17 | 11 | 12 | 9 |
| Piscataquis County | 64 | 7 | 3 | 4 | 69 | 18 | - | 38 | 139 | 50 | 5 | 8 |
| Sagadahoc County | 43 | 37 | 109 | - | 100 | 134 | 10 | 66 | 456 | 49 | 51 | 440 |
| Sagadahoc, Richmond Farmers' and Mechanics' Club | 11 | 3 | 11 | - | 27 | 12 | 2 | 24 | 54 | - | - | 21 |
| Somerset County | 20 | 2 | 12 | 2 | 65 | 40 | 12 | - | 133 | 73 | - | 17 |
| Somerset, East | 147 | 3 | 23 | 8 | 56 | 18 | 12 | 30 | 108 | 50 | 17 | 12 |
| Somerset, Central | 31 | 8 | 12 | - | 35 | 50 | 4 | - | 109 | 7 | - | 35 |
| Somerset, Bingham | 9 | 2 | - | 1 | 3 | 14 | 2 | - | 22 | 5 | - | - |
| Waldo County | 34 | 3 | 19 | 2 | 23 | 20 | 2 | - | 69 | 41 | 7 | 18 |
| Waldo and Penobscot | 66 | 26 | 86 | 21 | 50 | 78 | 16 | 90 | 367 | 49 | 6 | 14 |
| Waldo, North | 39 | 1 | - | 8 | 19 | 24 | 3 | 6 | 61 | 23 | 10 | 6 |
| Washington County | 35 | 7 | 22 | - | 34 | 10 | - | 30 | 93 | 58 | 31 | 29 |
| Washington, West | 50 | 7 | 12 | - | 39 | 24 | - | 12 | 94 | 78 | 8 | 54 |
| York, Shapleigh and Acton | 8 | - | - | 6 | 14 | 104 | 8 | - | 132 | 7 | 4 | 28 |
| York, Ossipee Valley Union | 24 | 7 | 20 | - | 22 | 138 | 2 | 28 | 217 | 6 | 6 | 20 |

## 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 | $48 00 | $27 00 |
| Androscoggin, Durham | 5 00 | 3 00 | - | - | 15 00 | 3 00 | - | 10 00 | 8 00 |
| Aroostook County | 14 00 | 6 00 | 25 00 | 6 00 | 6 00 | 5 50 | - | 30 50 | 8 00 |
| Aroostook, North | - | 4 50 | 4 50 | 4 50 | 5 50 | 2 50 | - | 28 50 | - |
| Aroostook, Madawaska | 1 50 | 1 50 | - | - | 1 50 | - | 1 25 | 3 25 | 2 25 |
| Cumberland County | 27 00 | - | - | 30 00 | - | 25 00 | - | 55 00 | 42 00 |
| Cumberland, North | 3 00 | - | - | 3 00 | - | - | 6 00 | 6 00 | 70 00 |
| Cumberland Farmers' Club | 2 00 | 3 00 | - | - | - | 10 00 | - | 2 00 | - |
| Cumberland, Gray Park Association | 5 00 | 5 00 | - | 5 00 | 3 00 | 15 00 | 8 00 | 10 50 | - |
| Cumberland, Bridgton Farmers' and Mechanics' Association | 10 00 | 7 00 | - | 3 00 | 7 00 | - | 16 00 | 18 00 | 39 00 |
| Cumberland, New Gloucester and Danville | 5 00 | 3 00 | - | - | 3 00 | 8 00 | 2 00 | 5 00 | 7 00 |
| Cumberland, Lake View Park | 5 00 | 2 00 | - | - | - | - | - | - | 14 00 |
| Franklin County | - | - | - | - | - | - | - | - | - |
| Franklin, North | 4 00 | 8 50 | 3 00 | 4 00 | - | 7 00 | - | 12 50 | - |
| Hancock County | 11 00 | - | 5 00 | 7 00 | - | 2 00 | - | 10 00 | - |
| Hancock, North | - | - | - | - | 3 50 | - | - | 3 00 | 22 00 |
| Hancock County Fair Association | 23 50 | 22 00 | 6 00 | - | - | 10 00 | - | 22 50 | 20 00 |
| Hancock, Eden | - | 3 00 | - | - | - | - | - | 2 00 | 2 00 |
| Kennebec County | 19 00 | 17 00 | 16 50 | 9 00 | 9 00 | 25 00 | 6 00 | 18 00 | 18 00 |
| Kennebec, South | 4 75 | 3 75 | - | - | 2 25 | 4 50 | 2 50 | 8 25 | 12 50 |
| Kennebec, Pittston Agricultural and Trotting Park Association | - | 2 00 | - | - | - | - | - | 4 50 | - |
| Knox, North | 3 00 | - | - | 2 00 | 3 00 | 2 50 | 3 50 | 11 50 | 27 75 |
| Lincoln County | - | - | - | - | - | - | - | - | - |
| Lincoln, Bristol | - | - | - | - | - | - | - | - | 8 00 |
| Oxford County | 20 00 | 27 00 | - | - | - | 35 00 | 25 00 | 41 00 | 65 00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Oxford, Riverside Park Association | - | - | - | - | - | - | - | - | - |
| Oxford, West | 21 00 | 7 00 | 6 00 | 7 00 | 7 00 | 25 00 | 9 00 | 16 50 | 44 00 |
| Oxford, Androscoggin Valley | 22 00 | 6 00 | - | - | - | 8 00 | 7 00 | 15 60 | 5 00 |
| Oxford, North | - | 3 00 | 3 00 | - | - | - | - | 4 10 | 20 00 |
| Penobscot, Lee Union | - | 1 50 | - | - | - | - | - | 4 00 | 3 50 |
| Penobscot, West | 12 00 | 33 50 | 4 00 | 4 00 | - | 7 00 | 5 00 | - | 23 00 |
| Penobscot, North | - | - | - | 3 50 | 1 50 | 1 50 | - | 8 75 | 2 00 |
| Penobscot, East Eddington Farmers' Club | - | - | - | - | - | - | - | - | 7 00 |
| Penobscot, Orrington | - | 2 00 | - | 2 00 | - | 5 00 | - | 1 50 | - |
| Piscataquis County | 5 00 | 12 00 | 8 00 | 5 00 | - | 5 00 | - | 47 00 | 18 00 |
| Sagadahoc County | 5 00 | 10 00 | 5 00 | 5 00 | - | 15 00 | - | 19 00 | 45 00 |
| Sagadahoc, Richmond Farmers' and Mechanics' Club | - | - | 75 | 1 25 | 1 65 | - | - | 1 75 | 2 00 |
| Somerset County | 2 00 | 3 00 | - | - | 3 50 | 3 00 | - | 9 50 | 36 00 |
| Somerset, East | 7 50 | 5 00 | - | - | 4 50 | 25 00 | 4 50 | 20 00 | - |
| Somerset, Central | 6 00 | 6 00 | 4 50 | 4 50 | - | 10 50 | - | 10 75 | 15 00 |
| Somerset, Bingham | - | 2 50 | - | - | 2 50 | - | - | 2 50 | 4 00 |
| Waldo County | 3 00 | 3 00 | 2 00 | - | - | - | 3 00 | 8 50 | 7 00 |
| Waldo and Penobscot | 29 00 | 12 00 | 12 00 | - | 14 00 | 24 00 | 18 00 | 20 00 | 62 00 |
| Waldo, North | 12 00 | 6 00 | 5 00 | 4 00 | 3 50 | 6 00 | 6 00 | 20 50 | 6 00 |
| Washington County | - | - | - | - | - | - | - | - | - |
| Washington, West | 16 00 | 9 00 | - | 4 00 | 2 00 | 75 00 | - | 49 00 | 52 00 |
| York, Shapleigh and Acton | - | 2 00 | - | - | 3 50 | 3 00 | - | - | - |
| York, Ossipee Valley Union | 11 00 | 9 50 | - | - | - | 6 00 | 3 00 | 3 50 | 5 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 | $76 00 | $84 00 | - | $96 00 | $20 00 | $7 00 | $35 00 | $9 00 | $16 00 | $84 00 | $64 00 |
| Androscoggin, Durham | 4 00 | 5 50 | $4 00 | 21 00 | 5 00 | 10 00 | 4 00 | 2 00 | 5 00 | - | 20 00 |
| Aroostook County | 51 00 | 65 00 | 7 00 | 37 00 | 16 00 | - | - | - | - | - | - |
| Aroostook, North | 40 50 | 46 00 | 7 25 | 21 25 | 11 00 | 6 00 | - | 4 00 | - | - | - |
| Aroostook, Madawaska | 75 | - | 4 50 | 2 50 | 6 40 | 75 | 1 50 | 2 25 | 3 25 | 4 50 | 2 50 |
| Cumberland County | 29 00 | 80 00 | - | - | 60 00 | 40 00 | - | - | 18 00 | 20 00 | 78 00 |
| Cumberland, North | 10 00 | 3 00 | 5 00 | 5 00 | 37 00 | 10 00 | 24 00 | 5 00 | 6 00 | 15 00 | 72 00 |
| Cumberland Farmers' Club | 21 00 | 33 00 | - | 20 00 | 24 00 | 13 00 | 14 00 | - | 9 00 | 28 00 | 26 50 |
| Cumberland, Gray Park Association | 5 00 | 18 00 | 3 00 | 24 50 | 18 00 | 9 00 | 6 00 | - | 3 00 | 33 00 | 24 00 |
| Cumberland, Bridgton Farmers' and Mechanics' Asso | 55 00 | 55 00 | - | 34 50 | 10 00 | 9 00 | 42 50 | 4 00 | 13 50 | 24 00 | 57 00 |
| Cumberland, New Gloucester and Danville | 7 00 | 12 00 | 3 00 | 35 50 | 10 00 | 5 00 | 5 00 | 3 00 | 2 00 | - | 5 00 |
| Cumberland, Lake View Park | - | - | 7 00 | 26 00 | 4 00 | 3 00 | 3 00 | - | 3 00 | 7 00 | 3 00 |
| Franklin County | - | - | - | - | - | - | - | - | - | - | - |
| Franklin, North | 10 40 | 21 95 | 4 40 | 17 50 | 8 00 | 3 50 | 10 00 | 2 50 | 7 25 | 33 00 | 6 00 |
| Hancock County | 12 00 | 4 00 | 14 00 | 46 00 | - | 28 00 | - | - | 2 50 | - | 23 00 |
| Hancock, North | - | - | 2 50 | 11 50 | - | 2 00 | 5 25 | - | - | - | - |
| Hancock County Fair Association | 27 25 | 24 75 | - | 36 75 | - | 23 00 | - | - | - | - | 16 00 |
| Hancock, Eden | - | - | 6 00 | 10 00 | - | - | - | - | - | - | - |
| Kennebec County | 32 00 | 30 50 | - | 34 50 | 21 00 | 33 00 | 14 00 | 10 00 | 24 00 | 63 00 | 40 00 |
| Kennebec, South | 13 00 | 27 00 | 11 25 | 23 80 | 15 75 | 18 25 | 21 50 | 1 00 | 3 00 | 37 00 | 13 50 |
| Kennebec, Pittston Agricultural & Trotting Park Asso | 1 00 | 7 00 | 5 00 | 18 00 | 5 00 | 11 00 | 5 00 | 3 00 | 8 00 | 26 00 | 5 00 |
| Knox, North | 8 00 | 11 00 | 6 00 | 25 00 | 12 00 | 8 00 | 10 00 | - | 3 50 | 19 00 | 11 25 |
| Lincoln County | - | - | - | - | - | - | - | - | - | - | - |
| Lincoln, Bristol | - | 1 00 | - | 6 50 | - | - | - | - | - | - | 9 00 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oxford County | 132 00 | 120 00 | - | 183 00 | 36 00 | 127 00 | 63 00 | - | 5 00 | 98 00 | 114 25 |
| Oxford, Riverside Park Association | - | - | - | - | - | - | - | - | - | - | - |
| Oxford, West | 34 00 | 99 00 | 5 00 | 19 00 | 20 00 | 18 00 | 39 00 | 7 00 | 12 00 | 74 00 | 69 00 |
| Oxford, Androscoggin Valley | 10 00 | 2 00 | 7 50 | 8 00 | 4 00 | 23 00 | 28 00 | 3 00 | 5 00 | 18 00 | 24 50 |
| Oxford, North | 4 00 | 9 25 | 50 | 6 15 | 5 00 | 1 50 | 6 20 | - | 1 00 | - | 24 00 |
| Penobscot, Lee Union | 2 50 | 4 00 | 4 75 | 3 50 | - | 2 25 | - | - | - | - | 1 50 |
| Penobscot, West | 48 00 | 112 00 | 12 50 | 69 00 | 42 00 | 56 00 | 25 00 | 10 00 | 10 00 | - | - |
| Penobscot, North | 1 50 | 3 00 | 2 00 | 11 00 | - | - | - | - | - | - | - |
| Penobscot, East Eddington Farmers' Club | - | - | - | - | - | - | - | - | - | - | - |
| Penobscot, Orrington | - | - | 1 75 | 5 00 | 4 00 | - | - | - | - | - | - |
| Piscataquis County | 28 00 | 15 00 | 6 00 | 58 00 | 35 00 | - | 16 00 | - | - | - | - |
| Sagadahoc County | 108 75 | 175 75 | - | 116 25 | 46 00 | 72 00 | 32 50 | 10 00 | 12 00 | 46 00 | 51 00 |
| Sagadahoc, Richmond Farmers' and Mechanics' Club | 2 30 | 4 00 | - | 7 40 | 2 00 | 95 | 1 50 | - | 60 | - | - |
| Somerset County | 2 00 | 9 25 | 2 00 | 36 75 | - | 9 00 | 10 50 | - | 5 00 | - | 12 00 |
| Somerset, East | 4 50 | 6 75 | 6 75 | - | 9 00 | 10 50 | - | - | 12 25 | - | 4 50 |
| Somerset, Central | 11 00 | 30 00 | - | 40 00 | - | 19 00 | 12 50 | - | 6 00 | - | 15 00 |
| Somerset, Bingham | 3 00 | - | 1 00 | 3 25 | - | - | 9 75 | - | - | - | - |
| Waldo County | 5 00 | 13 50 | 1 00 | 26 50 | 8 00 | 8 00 | 5 00 | 4 00 | - | - | - |
| Waldo and Penobscot | 93 00 | 236 00 | 39 00 | 118 00 | 168 00 | 20 00 | 41 00 | 12 00 | 36 00 | 20 00 | 42 00 |
| Waldo, North | 4 00 | - | 23 00 | 20 50 | 6 00 | 17 00 | - | - | 6 00 | - | 5 00 |
| Washington County | - | - | - | - | - | - | - | - | - | - | - |
| Washington, West | 47 00 | 49 00 | - | 58 00 | 20 00 | 70 00 | - | - | - | - | - |
| York, Shapleigh and Acton | - | - | 6 00 | 12 75 | - | 12 00 | 25 75 | - | 6 00 | 45 00 | 12 00 |
| York, Ossipee Valley Union | 16 00 | 22 00 | - | 56 00 | 12 00 | 41 00 | 32 00 | - | 5 00 | 40 00 | 34 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. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Maine State Pomological | - | - | - | - | $341 50 | - | - | - | - | - | $341 50 |
| Maine State Poultry and Pet Stock Association | - | - | $893 50 | - | - | - | - | - | - | - | 893 50 |
| Androscoggin County | $7 00 | $18 00 | 94 00 | $104 00 | 78 00 | $36 00 | $13 00 | $5 00 | $94 00 | $238 00 | 1,335 00 |
| Androscoggin, Durham | 12 00 | 8 00 | 12 00 | 31 00 | 20 50 | 5 00 | 12 00 | - | 20 00 | 16 25 | 261 25 |
| Aroostook County | 35 75 | 13 00 | 39 25 | 30 00 | 25 30 | 10 75 | - | - | 34 76 | - | 465 81 |
| Aroostook, North | 18 00 | 4 00 | 24 50 | 73 70 | 53 05 | 17 00 | 4 75 | - | 33 35 | 64 72 | 479 07 |
| Aroostook, Madawaska | 5 25 | - | - | 8 50 | - | 4 25 | - | 2 50 | 2 05 | - | 62 70 |
| Cumberland County | 21 00 | 4 00 | 67 50 | 13 00 | 24 50 | 25 25 | 5 00 | 15 00 | 25 00 | - | 704 25 |
| Cumberland, North | 3 00 | 9 00 | 13 75 | 14 50 | 15 50 | 8 25 | 2 00 | 1 00 | 26 00 | 9 50 | 382 50 |
| Cumberland Farmers' Club | - | 2 00 | 38 00 | 37 00 | 25 25 | 10 25 | - | - | 23 00 | 5 00 | 346 00 |
| Cumberland, Gray Park Association | 6 00 | 4 00 | 13 00 | 8 75 | 10 45 | 5 70 | 1 50 | - | 16 50 | 23 50 | 284 40 |
| Cumberland, Bridgton Farmers' and Mechanics' Association | 26 00 | 5 00 | 17 40 | 47 50 | - | 9 50 | - | 7 25 | 30 00 | 26 00 | 573 15 |
| Cumberland, New Gloucester and Danville | 2 00 | 5 00 | 30 75 | 11 20 | 19 80 | 6 75 | - | - | 18 05 | 6 60 | 220 65 |
| Cumberland, Lake View Park | 2 00 | - | 3 25 | 8 75 | 9 25 | 3 00 | - | - | 10 25 | - | 113 50 |
| Franklin County | - | - | - | - | - | - | - | - | - | - | 1,011 55 |
| Franklin, North | 13 25 | 4 75 | 12 15 | 16 20 | 12 95 | 4 25 | 2 50 | 1 00 | 22 10 | - | 252 65 |
| Hancock County | 12 00 | 11 00 | 3 75 | 48 10 | 22 90 | 7 45 | 4 35 | - | 31 35 | 5 55 | 310 95 |
| Hancock, North | 3 25 | 2 00 | 5 10 | 37 80 | 21 00 | 1 00 | 2 85 | - | 35 50 | 10 00 | 168 25 |
| Hancock County Fair Association | 26 75 | 15 25 | 29 50 | 59 75 | 42 25 | 21 70 | 5 75 | - | 47 75 | 29 50 | 509 95 |
| Hancock, Eden | 1 00 | 4 00 | 6 00 | 35 00 | 7 00 | 2 00 | 35 | - | 10 00 | 7 00 | 95 35 |
| Kennebec County | 30 00 | 18 00 | 36 00 | 103 00 | 84 50 | 34 75 | 9 00 | - | 90 75 | 5 00 | 850 50 |
| Kennebec, South | 17 50 | 3 00 | 8 95 | 23 00 | 24 40 | 10 80 | 1 75 | - | 53 35 | 50 | 366 80 |
| Kennebec, Pittston Agricultural and Trotting Park Association | 3 49 | 2 00 | 5 00 | 2 00 | 12 00 | 5 00 | - | - | - | - | 129 99 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Knox, North | 10 55 | 3 30 | 19 75 | 15 10 | 24 45 | 9 00 | 7 75 | - | 30 90 | 6 78 | 294 |
| Lincoln County | - | - | - | - | - | - | - | - | - | - | 371 50 |
| Lincoln, Bristol | 4 00 | - | 9 50 | 21 50 | 9 15 | 5 25 | 50 | - | 48 50 | 3 00 | 125 90 |
| Oxford County | 70 00 | 41 00 | 26 80 | 50 00 | 44 25 | 48 50 | 15 10 | 8 00 | 36 90 | 169 55 | 1,601 35 |
| Oxford, Riverside Park Association | - | - | - | - | - | - | - | - | - | - | 495 73 |
| Oxford, West | 24 00 | 19 00 | 36 50 | 58 50 | - | 29 40 | 14 50 | 6 50 | 29 30 | 22 25 | 778 45 |
| Oxford, Androscoggin Valley | 6 50 | - | 6 90 | 17 00 | 26 15 | 13 25 | 1 50 | 2 00 | 21 35 | 27 00 | 318 25 |
| Oxford, North | 16 25 | 8 75 | 9 00 | 15 50 | 6 40 | 12 90 | 90 | - | 19 45 | 15 00 | 191 85 |
| Penobscot, Lee Union | 1 50 | 2 50 | - | 3 00 | 2 25 | 1 00 | - | - | 6 00 | - | 43 75 |
| Penobscot, West | 21 50 | 6 00 | 12 90 | 23 30 | 33 15 | 16 00 | 5 40 | - | 121 93 | 35 72 | 748 90 |
| Penobscot, North | - | 2 00 | 75 | 7 05 | 8 00 | 1 00 | 2 00 | - | 17 45 | - | 73 00 |
| Penobscot, East Eddington Farmers' Club | - | - | - | 28 70 | 12 65 | 2 75 | - | - | 9 85 | 7 75 | 68 70 |
| Penobscot, Orrington | 4 25 | 2 00 | 3 00 | 12 75 | 26 50 | 3 00 | 1 50 | - | 25 65 | 17 50 | 117 40 |
| Piscataquis County | 20 00 | 10 00 | 12 00 | 2 50 | 15 00 | 7 00 | 1 00 | - | 7 50 | 3 00 | 336 00 |
| Sagadahoc County | 24 50 | 22 00 | 122 50 | 103 50 | 88 00 | 63 50 | 5 75 | - | 80 50 | 270 62 | 1,555 12 |
| Sagadahoc, Richmond Farmers' and Mechanics' Club | - | - | 4 05 | 12 85 | 8 75 | 3 35 | 25 | 25 | 11 35 | 5 45 | 72 45 |
| Somerset County | 24 00 | - | 9 00 | 6 70 | 3 05 | 2 00 | - | - | 6 60 | - | 194 85 |
| Somerset, East | 14 25 | 6 00 | 14 75 | 5 25 | 7 75 | 3 75 | 3 25 | - | 4 25 | 82 00 | 262 00 |
| Somerset Central | 5 00 | - | 30 00 | 11 25 | 8 25 | 6 00 | - | - | 5 75 | 5 00 | 262 00 |
| Somerset, Bingham | 4 00 | - | - | 2 40 | 1 25 | 1 35 | 25 | 50 | 1 75 | 2 55 | 42 55 |
| Waldo County | 10 50 | 2 00 | 8 50 | 10 50 | 11 50 | 2 00 | - | - | 54 25 | 8 50 | 205 25 |
| Waldo and Penobscot | 50 00 | 23 00 | 15 25 | 42 75 | 52 25 | 34 60 | 1 50 | - | 148 80 | 31 25 | 1,415 40 |
| Waldo, North | 27 00 | 5 00 | 4 00 | 33 50 | 6 25 | 11 50 | 18 75 | - | 28 75 | - | 285 25 |
| Washington County | - | - | - | - | - | - | - | - | - | - | 149 62 |
| Washington, West | 102 00 | 11 00 | 43 50 | 163 40 | 90 90 | 28 70 | 1 75 | - | 115 80 | 53 50 | 1,061 55 |
| York, Shapleigh and Acton | 5 50 | 5 00 | 18 25 | 50 25 | 25 00 | 10 00 | 10 50 | - | 26 00 | 92 00 | 370 50 |
| York, Ossipee Valley Union | 6 00 | 6 00 | - | 57 27 | - | - | - | - | - | 32 00 | 397 27 |

# 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 recipts. | Amount expended in improvements. | Amount expended in trotting purses. | Expenses during the fair. | Amount expended for all other purposes. | Total amount paid out including premiums and gratuities. | Value of property belonging to the society. | Amount of liabilities. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maine State Pomological Society......... | $1,250 00 | $61 00 | - | - | $434 04 | $1,745 04 | - | - | - | $1,281 53 | $1,623 03 | $1,410 00 | - |
| Maine State Poultry and Pet Stock Ass'n. | - | 270 00 | - | - | 1,590 25 | 1,860 25 | $268 61 | - | - | 319 23 | 1,481 34 | 300 00 | $300 00 |
| Androscoggin County......... . ....... | 512 00 | 72 00 | $400 00 | $335 50 | 1,478 75 | 2,798 25 | 100 00 | $650 00 | $720 85 | 23 50 | 2,829 35 | 600 00 | 1,000 00 |
| Androscoggin, Durham................ | - | - | - | 48 00 | 323 00 | 371 00 | 70 00 | 220 00 | 287 15 | - | 838 40 | 2,000 00 | 1,500 00 |
| Aroostook County...................... | - | 156 00 | 25 00 | 322 50 | 2,537 73 | 3,041 23 | 265 90 | 927 75 | 406 87 | 974 90 | 3,041 23 | - | 150 75 |
| Aroostook, North.. ... .................. | 185 93 | 74 20 | - | 275 00 | 2,857 53 | 3,392 66 | 75 00 | 842 75 | 368 50 | 1,627 34 | 3,392 66 | 4,000 00 | 2,016 00 |
| Aroostook, Madawaska.................. | 20 90 | 19 00 | - | - | 27 88 | 67 78 | - | - | - | - | 62 70 | - | - |
| Cumberland County... ..... ............. | 227 95 | - | - | 372 50 | 2,451 94 | 3,052 39 | 184 21 | 795 00 | 924 60 | 337 13 | 2,945 19 | 4,100 00 | 950 00 |
| Cumberland, North.................. ....... | 124 48 | - | - | - | 332 61 | 457 09 | 10 00 | - | 50 00 | 20 00 | 462 50 | 2,500 00 | 10 00 |
| Cumberland Farmers' Club.......... ..... | 159 75 | 17 00 | - | 167 50 | 990 04 | 1,334 29 | 218 01 | 400 00 | 123 32 | 240 13 | 1,327 46 | 3,000 00 | 300 00 |
| Cumberland, Gray Park Association ..... | 108 79 | - | - | 77 50 | 1,049 67 | 1,235 96 | - | 366 25 | 559 84 | 16 00 | 1,226 49 | 9,000 00 | - |
| Cumberland, Bridgton Farmers' and Mechanics' Association.... ....... ..... | 194 13 | - | - | 56 25 | 1,674 48 | 1,924 86 | 295 06 | 643 15 | 345 41 | 47 80 | 1,904 57 | 2,800 00 | - |
| Cumberland, New Gloucester and Danville ............................... .... | 93 52 | 5 00 | - | 150 00 | 553 68 | 802 20 | 44 02 | 350 00 | 146 10 | 67 55 | 828 32 | - | - |
| Cumberland, Lake View Park ........... | 26 68 | - | - | 29 25 | 286 70 | 342 63 | 65 00 | 118 25 | 44 50 | - | 341 25 | 650 00 | 75 00 |
| Franklin County............. ..... ...... | 362 20 | 668 00 | - | 395 00 | 2,093 66 | 3,518 86 | 300 00 | 1,132 50 | 788 65 | 251 00 | 3,483 70 | 10,000 00 | - |
| Franklin, North.......................... .. | 104 59 | 259 50 | 100 00 | 57 50 | 552 44 | 1,074 03 | 75 00 | 272 75 | 110 00 | 301 58 | 1,011 98 | 3,762 05 | 2,585 46 |
| Hancock County... . ..................... | 109 47 | - | - | 108 50 | 1,221 95 | 1,439 92 | - | 389 50 | 267 01 | 6 00 | 973 46 | 4,000 00 | - |
| Hancock, North....................... ... | 57 32 | 2 00 | - | - | 434 83 | 494 15 | - | - | 255 60 | 63 11 | 486 96 | 150 00 | - |
| Hancock County Fair Association........ | 198 21 | - | - | 145 00 | 2,317 07 | 2,660 28 | 207 25 | 665 00 | 1,124 50 | 460 00 | 2,966 70 | 11,000 00 | 434 60 |
| Hancock, Eden......................... ..... | 32 98 | 5 25 | - | - | 864 67 | 902 90 | 150 00 | - | 90 00 | 542 78 | 878 13 | 1,100 00 | 425 00 |
| Kennebec County .... ..................... | 266 35 | 2 00 | 500 00 | 220 00 | 1,464 69 | 2,453 04 | 183 90 | 600 00 | 419 00 | 103 24 | 2,156 64 | 4,000 00 | 1,400 00 |
| Kennebec, South............................ | 149 15 | 50 00 | - | 55 00 | 1,577 26 | 1,831 41 | 34 80 | 417 00 | 327 94 | 567 50 | 1,714 04 | 2,400 00 | - |
| Kennebec, Pittston Agricultural and Trotting Park Association ............. | 86 00 | - | - | 40 00 | 174 25 | 300 25 | 50 00 | 425 00 | 25 00 | - | 629 99 | 1,500 00 | 1,100 00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Knox, North | 109 58 | 383 55 | - | 34 75 | 1,194 23 | 1,722 11 | - | 336 25 | 373 33 | 295 73 | 1,299 89 | 50 00 | - |
| Lincoln County | 135 15 | 16 00 | - | 145 75 | 1,203 28 | 1,500 18 | 75 00 | 370 00 | 186 97 | 413 07 | 1,416 54 | 3,000 00 | 300 00 |
| Lincoln, Bristol | 38 56 | 2 25 | - | - | 344 96 | 385 77 | 19 43 | - | 68 47 | 84 50 | 298 30 | 1,000 00 | - |
| Oxford County | 598 54 | 14 00 | - | 268 75 | 4,526 09 | 5,407 38 | 325 00 | 1,055 00 | 383 18 | 2,656 90 | 6,021 43 | 10,000 00 | - |
| Oxford, Riverside Park Association | 217 23 | - | - | 113 50 | 340 80 | 671 53 | 175 00 | 325 00 | - | - | 995 73 | 2,500 00 | - |
| Oxford, West | 268 58 | 76 00 | - | 347 50 | 2,760 47 | 3,452 55 | 400 00 | 850 00 | 360 60 | 313 77 | 2,702 82 | 8,325 00 | 1,000 00 |
| Oxford, Androscoggin Valley | 134 62 | 20 00 | - | 470 25 | 1,867 80 | 2,492 67 | 430 00 | 1,075 00 | 262 40 | 322 92 | 2,408 57 | 2,500 00 | 2,397 35 |
| Oxford, North | 81 46 | - | - | 131 25 | 678 39 | 891 10 | 50 00 | 352 50 | 60 00 | 100 00 | 754 35 | 3,000 00 | - |
| Penobscot, Lee Union | - | - | - | - | 27 00 | 27 00 | - | - | 12 00 | - | 55 75 | - | 17 70 |
| Penobscot, West | 253 04 | 113 00 | - | 323 75 | 1,675 39 | 2,365 18 | 150 00 | 815 00 | 497 00 | 158 28 | 2,369 18 | 6,000 00 | 3,400 00 |
| Penobscot, North | 42 58 | - | - | - | 80 00 | 122 58 | 10 00 | - | 30 00 | - | 113 00 | - | - |
| Penobscot, East Eddington Farmers' Club | 39 80 | - | - | - | 173 88 | 213 68 | - | - | 104 50 | - | 173 20 | 1,500 00 | - |
| Penobscot, Orrington | 51 42 | - | 75 00 | 79 75 | 530 46 | 736 63 | 145 00 | 300 75 | 105 25 | 49 08 | 717 48 | 1,200 00 | 325 00 |
| Piscataquis County | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sagadahoc County | 560 13 | 477 00 | 2,700 00 | 631 25 | 4,565 57 | 8,933 95 | - | 1,225 00 | 1,607 37 | 3,577 30 | 7,964 79 | 7,000 00 | 1,100 00 |
| Sagadahoc, Richmond Farmers' and Mechanics' Club | 27 96 | - | - | - | 117 90 | 145 86 | 33 36 | - | 15 25 | 38 49 | 159 55 | 75 00 | 10 41 |
| Somerset County | 73 55 | - | | 80 00 | 587 35 | 740 90 | 52 00 | 225 00 | 56 65 | 93 50 | 622 00 | 1,150 00 | - |
| Somerset, East | - | 34 50 | - | 102 50 | 717 50 | 854 50 | 112 50 | 400 00 | 80 00 | - | 854 50 | 2,500 00 | 1,550 00 |
| Somerset, Central | 94 71 | - | 300 00 | 190 00 | 1,295 25 | 1,879 96 | 50 00 | 450 00 | 1,079 00 | 287 00 | 2,128 00 | 2,700 00 | 900 00 |
| Somerset, Bingham | - | 44 00 | - | - | 22 25 | 66 25 | - | - | - | 6 53 | 49 08 | - | - |
| Waldo County | 39 63 | 30 00 | - | 156 00 | 867 53 | 1,093 16 | 165 56 | 595 00 | 180 05 | 190 20 | 1,336 06 | 3,500 00 | - |
| Waldo and Penobscot | 250 00 | - | 28 88 | 460 00 | 2,949 80 | 3,688 68 | - | 1,243 50 | 559 33 | 728 41 | 3,946 64 | 4,000 00 | 350 00 |
| Waldo, North | 110 78 | 33 00 | - | 185 00 | 312 72 | 641 50 | - | 450 00 | 200 54 | - | 935 79 | - | 294 29 |
| Washington County | 163 76 | - | - | 90 00 | 552 75 | 806 51 | 48 55 | 255 00 | 191 93 | 163 90 | 809 00 | 1,700 00 | 1,000 00 |
| Washington, West | 328 89 | 2 00 | - | 275 00 | 2,497 57 | 3,103 46 | 65 75 | 1,050 00 | 865 00 | 88 22 | 3,130 52 | 2,232 00 | 1,009 73 |
| York, Shapleigh and Acton | 134 34 | 210 00 | 60 00 | - | 23 45 | 427 79 | - | - | 11 50 | 25 25 | 407 25 | 2,000 00 | - |
| York, Ossipee Valley Union | 200 00 | - | - | 402 50 | 1,781 02 | 2,383 52 | 50 00 | 935 00 | 256 83 | 744 42 | 2,383 52 | 6,500 00 | 1,365 00 |

SEVENTEENTH ANNUAL REPORT

OF THE

# Maine Agricultural Experiment Station

ORONO, MAINE,

1901.

# MAINE

# AGRICULTURAL EXPERIMENT STATION

# ORONO, MAINE.

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## THE STATION COUNCIL.

| | |
|---|---|
| President Abram W. Harris | *President* |
| Director Charles D. Woods | *Secretary* |
| Edward B. Winslow, Portland | *Committee of Board of Trustees* |
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| James M. Bartlett | *Members of the Station Staff* |
| Lucius H. Merrill | |
| Fremont L. Russell | |
| Welton M. Munson | |
| Gilbert M. Gowell | |
| Gilman A. Drew | |

## THE STATION STAFF.

### The President of the University.

| | |
|---|---|
| Charles D. Woods | *Director* |
| James M. Bartlett | *Chemist* |
| Lucius H. Merrill | *Chemist* |
| Fremont L. Russell | *Veterinarian* |
| Welton M. Munson | *Horticulturist* |
| Gilbert M. Gowell | *Stock Breeding and Poultry* |
| Gilman A. Drew | *Zoologist* |
| Lucius J. Shepard | *Assistant in Agriculture* |
| Ora W. Knight | *Assistant Chemist* |
| Edward R. Mansfield | *Assistant Chemist* |
| Clifford D. Holley | *Assistant Chemist* |
| *Perley Spaulding | *Assistant in Horticulture* |
| †Herbert W. Britcher | *Assistant Zoologist* |

* Resigned May, 1901.

† Appointed September, 1901.

STATE OF MAINE.

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

SIR:—I transmit herewith the Seventeenth Annual Report of the Maine Agricultural Experiment Station for the year ending December 31, 1901.

CHARLES D. WOODS,

*Director.*

ORONO, ME., December 31, 1901.

## TABLE OF CONTENTS.

## 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 glassware 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 several 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. The combined report for 1901 can be obtained by addressing the Commissioner 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 "Orono 5."

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.

CHAS. D. WOODS, *Director.*

# OATS AS GRAIN AND FODDER.

J. M. BARTLETT.

The oat crop ranks third in importance among American cereals in the United States and has a long lead as first in the State of Maine. In 1899 the State grew about 141,600 acres, which was six times as much land as was devoted to any other cereal, and about 5,000,000 bushels of the grain were raised. Owing to the low price and uncertain yield of wheat in recent years, the acreage devoted to oats has greatly increased.

Formerly the oat grain was only used as food for animals but now it holds a prominent place among nutrients for man. The grain varies quite widely in composition and weight. In the southern portions of our country it is much coarser, contains more hull, and is consequently more bulky, a measured bushel weighing sometimes as little as twenty pounds, while the northern grown grain frequently weighs over forty pounds. The quality and composition is also considerably affected by climatic conditions, such as moisture, heat and cold, etc.

The oat plant succeeds best in a cool, moist climate such as is found in northern and eastern Maine, the Provinces, and Prince Edward's Island. It will grow on most all kinds of soil, from light gravelly loam to stiff clays and peats. The oat is a great forager and will grow on poorer soil than wheat or barley. It thrives best and matures the plumpest grain on rather light soil well supplied with moisture, and sufficiently early to allow the oats to be sown the last of April or first of May. Late sown oats are liable to rust before the grain matures.

## INFLUENCE OF MANURE ON OATS.

Although oats will grow and yield moderate crops on poorer soils than most other cereals, they respond readily and profitably to liberal applications of manure. Too heavy applications of stable manures or nitrogenous fertilizers are liable to cause an excessive growth of straw at the expense of the grain. Oats require less nitrogen than wheat, and are greatly benefitted by liberal quantities of phosphoric acid, and this fact should be borne in mind in preparing land for them. If stable manure is employed, only a light coat should be added and then a supplementary dressing of acid phosphate applied. In using commercial manures alone, it is always best to use a complete manure unless the land has previously been well supplied with nitrogen from stable manures or some leguminous crop like clover or peas turned under, in which case, only phosphoric acid and potash need be applied with perhaps a little nitrate of soda to furnish soluble nitrogen to start the plants early. For a complete fertilizer it is recommended to use one carrying about 2.5% nitrogen, 8% available phosphoric acid, and 3% potash. A part of the nitrogen, at least .5%, should be in a soluble form as in nitrate of soda, and the remainder in some more insoluble form as tankage, ground fish or bone, in order that the young plant may be made vigorous and thrifty by the former, while the older plant can be kept growing by the latter. This recommendation is based upon results of a large number of experiments by Stoeckhardt which were repeated for several years. He found that when soluble nitrogen was lacking the crop did not prosper in the early stages of vegetation, and also when only soluble nitrogen compounds were used the growth fell off too soon after the plant had flowered. The experiments of both Stoeckhardt and Wolff show that a liberal supply of phosphoric acid is necessary to insure an abundance of plump, well-formed grain. Finely ground bone meal with small amounts of nitrate of soda and muriate of potash are recommended as a fertilizer for this crop.

## OATS AS GRAIN.

Oats are a valuable feed for most all farm animals. The relatively large amount of fiber they contain in proportion to kernel, as compared with most other grains, makes them a safer feed with but little danger of over feeding, when put in the hands of careless workmen. They contain a higher proportion of digestible protein than corn or wheat and are lower in carbohydrate materials, consequently the nutritive ratio of the grain is such that it contains in itself a quite well-balanced ration for working animals. They are a very convenient and highly prized grain for feeding horses. They usually are and should be fed unground to horses, unless the animal is unable to masticate his food properly. Experience shows that oats give a horse "mettle," or stimulate him as no other of our grains do. They are consequently held without a peer by horsemen as feed for driving horses and may be made almost exclusively their diet.

A chemist by the name of Sanson claims to have discovered a stimulating principle, supposed to be an alkaloid, in the seed coats of the oat grains, varying in quantity in different varieties of oats and also with soil and climate in which they are grown, but later careful investigations by chemists have failed to discover any alkaloid, or nitrogenous compound of a stimulating nature. Nevertheless the belief is so prevalent among practical feeders that nothing gives so much "mettle" to the horse as oats, it seems evident that they must contain something which, if not a stimulant, acts much like one and makes oats admirably adapted by their nature to this class of animals. For growing colts or dairy stock there is no question but that other grains or combinations such as wheat bran, middlings, linseed, gluten meals, etc., are more economical at present prices, and just as efficient.

Many experiments have been made to test the practicability of using substitutes for oats as feed for horses. At Hohenheim, Germany, in 1893-94 feeding experiments were conducted in which beans and corn were substituted quite largely for oats, the proportions being two pounds oats, three pounds field beans, eight pounds corn. In Paris also the Paris Omnibus Company substituted beans, corn and oil cake for a large portion of the oats in the grain ration, with good results. The New Jersey Experiment Station made an experiment with street car horses in which dried brewers' grains were substituted for oats. The horses fed the grains, performed their work and kept in as good condition as those fed oats. The conclusions of the station authorities were: "That dried brewers' grains, pound for pound, were quite equal to oats in a ration for work horses. The results of the substitution was a saving of about five cents a day for each animal.

The North Dakota Station compared wheat bran and shorts with oats for feeding horses and mules at quite severe work. The conclusions drawn from the experiment were: That the mixture of shorts (middlings) and bran proved of equal worth to oats for the working animals.

The Maine Experiment Station in 1890-91 compared a mixture consisting of twelve parts wheat middlings, seven parts gluten meal, three parts linseed meal, with oats as a grain ration for growing colts. The results of the two tests show that the mixed grain ration produced more rapid growth at less cost than the oat ration.

The above experiments show that other grains can be often profitably substituted for oats at present prices in rations for horses without detriment to the animal and a financial saving to the owner.

MAINE GROWN OATS.

In 1898 the writer, in estimating the food value of our different grains, had occasion to look up the composition of Maine oats and found that very few analyses of well authenticated Maine grown grain had been made, and as the composition of oats grown in different climates varies quite widely, the average analysis given for the whole country would not furnish very reliable data. Therefore it was considered advisable to collect samples of Maine grown oats from different parts of the State for analyses. The work was begun so late in 1898 that very few samples, five only, were obtained and very little data was given with them. Early in 1899 a circular was sent out to several parties in different parts of the State requesting samples and information as to methods of tillage, manuring, etc. Eleven samples were received from localities which represented nearly all the oat growing regions of the State.

The tables which follow give the data furnished by the growers of the oats as to previous treatment of the soil, its preparation for the crop, the dates of sowing and harvesting and the yield per acre. The weights of straws are largely estimates and therefore cannot be considered very accurate. The bushels are probably measured bushels and consequently would over run in the case of the heavy oats. The weights per bushel were estimated in the laboratory.

The weights of straws are largely estimates and therefore cannot be considered very accurate. The bushels are probably measured bushels and consequently would over run in the case of the heavy oats. The weights per bushel were estimated in the laboratory.

The table on page 15 gives the chemical composition of the grain calculated to water content at time of receipt and also as calculated to a water-free basis.

ANALYSIS OF MAINE GROWN OATS. FROM WHOM OBTAINED, WHERE THEY WERE GROWN, THE KIND OF SOIL, AND KINDS OF CROPS GROWN ON THE LAND IN PRECEDING YEARS.

| Station number of sample. | Furnished by. | Town Where Raised. | Kind of Soil. | Crops Raised on Land in | |
|---|---|---|---|---|---|
| | | | | 1897. | 1898. |
| 4142 | Ansel Briggs | North Auburn | Rocky loam | Corn. | |
| 4143 | J. Benn | Hodgdon. | | | |
| 4144 | J. M. Winslow | Nobleboro. | | | |
| 4145 | O. B. & E. S. Poor | Andover | Clay loam | Hay | Oats. |
| 4146 | W. G. Hunton | Readfield | | Hay | Oats. |
| 4187 | A. T. Griffin | Lincoln Center | Sandy loam | | Corn and beans. |
| 4188 | J. M. Winslow | Nobleboro | Coarse rocky loam | Hay | Corn. |
| 4189 | C. A. Brown | Lincoln | Light clay loam | Hay | Potatoes, oats and corn. |
| 4190 | E. M. Gerald | Clinton | Light clay loam | Hay | Hay. |
| 4195 | Y. W. Skelton | Bowdoin | Light clay and sand | Hay | Potatoes, corn and oats. |
| 4197 | Lewis C. Kimball | Hermon | Gravelly | Potatoes and corn | Potatoes and beans. |
| 4198 | G. W. Patten | West Pittsfield | Rocky poor loam | Hay | Hay. |
| 4200 | Lorimer McGlauflin | Charlotte | Light loam | Oats | Potatoes. |
| 4201 | Henry S. Balentine | Topsham | Medium clay loam | Hay | Corn and potatoes. |
| 4206 | Oscar Shirley | Houlton | Light clay loam | Hay | Potatoes. |
| 4207 | E. B. Owen | West Pembroke | Light clay loam | Oats, barley and potatoes | Oats, barley and potatoes. |

ANALYSIS OF MAINE GROWN OATS, MANURING, VARIETY, DATES OF PLANTING AND HARVESTING AND YIELDS PER ACRE

| Station Number of Sample. | How Manured in 1898. | How Manured in 1899. | Seed. | Date of Sowing. | Date of Harvesting. | Yield of Grain per Acre—Bushels. | Yield of Straw per Acre—Tons. |
|---|---|---|---|---|---|---|---|
| 4142 | Light coat of manure | | | | | 39½ | |
| 4143 | | | | | | | |
| 4144 | | | | | | | |
| 4145 | 12 cords manure to acre | | | | | 50 | |
| 4146 | Light coat of manure | | | | | 36 | |
| 4187 | Yard manure and fertilizer | 500 pounds to acre Bradley's Eureka | | May 15. | Sept. 1 | 46 | 2¾ |
| 4188 | 300 pounds fertilizer and 8 cords stable manure | None | | May 8. | Aug. 1 | 42 | 3 |
| 4189 | 4 cords manure, 500 lbs. cheap fertilizer | Six cords manure | Scottish Chief | May 1. | Aug. 16 | 55 | 1½ |
| 4190 | None | 600 pounds Packer's Union Fertilizer | Liberty | | Aug. 22 | 50 | 1¼ |
| 4195 | Seven cords manure per acre | Six cords manure, 800 lbs. Crocker's Potato to acre | Western | May 10. | Aug. 23 | 59 | 1½ |
| 4197 | Stable manure | Six cords stable manure to acre | Common | April 20. | Aug. 7 | 50 | 2 |
| 4198 | None | 500 pounds to acre Great Eastern | White Russian | May 15. | Aug. 15 | 46 | 1½ |
| 4200 | Barn manure and Bradley Fertilizer | None | Parker Oats | May 10. | Aug. 17 | 60 | 2½ |
| 4201 | Twenty loads stable manure per acre | Six cords stable manure | Common Western | May 11. | Aug. 14 | 50 | 2 |
| 4206 | None | Fifteen tons barn manure | Siberian | May 1. | Sept. 5-10 | 56 | 2 |
| 4207 | Fish pomace and barn manure | Four cords manure, 1000 pounds fish | Hogan | April 20. | Sept. 10 | 55 | 1 |

ANALYSES OF MAINE GROWN OATS. COMPOSITION OF THE OATS ON CURED AND WATER FREE BASIS.

| Variety. | Station number. | Weight per bushel. | Water. | Ash. | Protein. | Crude fiber. | Nitrogen-free extract. | Fat. | Calories per gram. |
|---|---|---|---|---|---|---|---|---|---|
| On Cured Basis. | | lbs. | % | % | % | % | % | % | |
| | 4142 | ..... | 8.39 | 3.03 | 10.63 | 13.92 | 59.27 | 4.76 | 4.247 |
| | 4143 | ...... | 8.66 | 3.59 | 11.69 | 13.47 | 57.88 | 4.71 | 4.215 |
| | 4144 | ...... | 8.73 | 3.01 | 13.00 | 12.13 | 58.20 | 4.93 | 4.270 |
| | 4145 | ..... | 11.15 | 2.92 | 12.56 | 11.28 | 57.70 | 4.39 | 4.161 |
| | 4146 | .... | 8.07 | 3.41 | 12.13 | 13.24 | 58.26 | 4.89 | 4.218 |
| | 4187 | 34 | 11.35 | 3.95 | 10.75 | 9.33 | 61.27 | 3.35 | 4.203 |
| | 4188 | 34 | 10.20 | 3.67 | 11.13 | 9.13 | 60.23 | 5.64 | 4.300 |
| Scottish Chief ............ | 4189 | 33½ | 10.23 | 3.19 | 10.88 | 8.31 | 62.17 | 5.22 | 4.250 |
| Liberty................ | 4190 | 31½ | 10.18 | 3.43 | 11.38 | 9.19 | 60.28 | 5.54 | 4.232 |
| Weston.................... | 4195 | 34½ | 10.92 | 3.08 | 11.25 | 8.64 | 60.25 | 5.86 | 4.285 |
| Common.................. | 4197 | 35 | 9.84 | 3.42 | 9.93 | 10.29 | 61.13 | 5.39 | 4.258 |
| White Russian. ........... | 4198 | 34½ | 9.21 | 3.14 | 12.75 | 10.10 | 58.36 | 6.44 | 4.376 |
| Parker Oats................ | 4200 | 41½ | 11.69 | 2.91 | 11.56 | 10.62 | 57.29 | 5.93 | 4.294 |
| Common Western......... | 4201 | 32½ | 9.09 | 3.91 | 12.57 | 11.71 | 56.08 | 6.64 | |
| Siberian................... | 4206 | 37 | 11.16 | 2.85 | 12.12 | 9.18 | 59.03 | 5.66 | |
| Hogan ...................... | 4207 | 41 | 9.46 | 2.84 | 11.50 | 11.03 | 60.13 | 5.04 | 4.291 |
| On Water Free Basis. | | | | | | | | | |
| | 4142 | ...... | ....... | 3.31 | 11.60 | 15.20 | 64.70 | 5.19 | 4.636 |
| | 4143 | ...... | ....... | 3.93 | 12.80 | 14.71 | 63.40 | 5.16 | 4.614 |
| | 4144 | ...... | ....... | 3.30 | 14.20 | 13.30 | 63.80 | 5.40 | 4.607 |
| | 4145 | ...... | ....... | 3.28 | 14.09 | 12.70 | 64.99 | 4.90 | 4.683 |
| | 4146 | ...... | ....... | 3.71 | 13.19 | 14.39 | 63.39 | 5.32 | 4.588 |
| | 4187 | ...... | ....... | 4.46 | 12.13 | 10.52 | 69.11 | 3.78 | 4.741 |
| | 4188 | ...... | ....... | 4.09 | 12.39 | 10.17 | 67.07 | 6.28 | 4.788 |
| Scottish Chief ............ | 4189 | ...... | ....... | 3.55 | 12.12 | 9.26 | 69.26 | 5.81 | 4.734 |
| Liberty.. .................. | 4190 | ...... | ....... | 3.82 | 12.67 | 10.23 | 67.11 | 6.17 | 4.712 |
| Weston. .. ............... | 4195 | ...... | ....... | 3.46 | 12.63 | 9.70 | 67.63 | 6.58 | 4.810 |
| Common ..................... | 4197 | ...... | ....... | 3.79 | 11.01 | 11.41 | 67.81 | 5.98 | 4.723 |
| White Russian............ | 4198 | ...... | ....... | 3.46 | 14.04 | 11.12 | 64.29 | 7.09 | 4.820 |
| Parker Oats ............... | 4200 | ...... | ....... | 3.30 | 13.09 | 12.03 | 64.87 | 6.71 | 4.862 |
| Common Western. ...... | 4201 | ...... | ....... | 4.30 | 13.83 | 12.88 | 61.69 | 7.30 | |
| Siberian .................... | 4206 | ...... | ....... | 3.21 | 13.64 | 10.33 | 66.45 | 6.37 | |
| Hogan ....................... | 4207 | ...... | ....... | 3.14 | 12.70 | 12.18 | 66.42 | 5.56 | 4.739 |

In the above table, where the weight per bushel of most of other samples are given, it will be noticed that contrary to the common belief the light oats show about as good chemical composition as the heavy ones. Therefore the food value of a bushel (32 pounds) of light oats is about the same as 32 pounds of heavy oats, and it seems to matter little whether oats weigh 32 or 40 pounds to the measured bushel if they are bought and fed by weight. Probably exceedingly light oats like those grown in the south, weighing much under 30 pounds, would contain a larger proportion of crude fiber and consequently less nutritive value; therefore the above statement as to feed value would only be true as regards northern grown, or the heavier oats, weighing over 30 pounds to the measured bushel.

### OATS AS HAY.

It is quite a common practice with many farmers to harvest oats before the grain is mature and cure them for coarse fodder. This is a very desirable plan to follow at times when the hay crop is short, or in localities where the land is badly infested with noxious weeds like the Canada thistle or wild mustard, both of which should be cut before they seed.

The oat plant, however, is not an ideal one for making hay. The stalks are hollow, coarse and hard, and unless dried very quickly in a bright sun they become bleached, even when cut green, so that they look little better than straw. To cure the crop in its best condition and retain its bright green color and palatability, it should be dried in a bright sun for a few hours, with liberal use of the hay tedder when there is a heavy growth; then raked together and the curing completed in the windrow or cock, with as little exposure to moisture as possible. If the weather is unfavorable, as is frequently the case during the latter part of July or first of August when oats are mature enough to cut for hay, they are very liable to be seriously injured and rendered unpalatable.

Oats, however, when not sown too thickly, have an advantage over other plants, which make more desirable hay, of being a fairly good catch crop for seeding to grass, as they mature early enough to allow the young grass to get a good start in the fall, and for this reason are desirable on the farm.

It is quite well known, and there is considerable experimental data showing that most plants like the grasses, clovers, etc., usually grown for hay are at their best to harvest when in bloom, but as regards oats there is very little available information indicating at what stage of growth they should be cut for hay making. Accordingly some experiments were undertaken to determine the comparative value of oat hay cut at different stages of maturity. In 1897 a section of a field of oats was set apart for these tests. The portion selected was covered with a fairly uniform growth and the oats in all parts of it appeared at about the same stage of maturity. The piece was then divided into three equal sections. One of these sections was cut on July 27th when the oats were in bloom. A second section was cut one week later, August 5th, when nearly all the kernels were in the milk stage, and the third August 12th when nearly all the grains had passed to the dough stage of maturity, the tops and upper portion of the stalks were green, but the lower portions showed signs of ripening. When cured this cutting made nearly as good looking hay as the other two sections, but evidently was not as palatable as it was not as readily eaten by the sheep. Care was taken in curing all the cuttings to avoid exposure to moisture, all were dried as quickly as possible and then stored in the barn until needed for further work.

To estimate the increased yield from the growth of the crop during the time that elapsed between the cuttings, three sections, each 10 x 15 feet, were taken in different parts of the large plats. One third, five feet of the length, was cut each time that cuttings were made from the larger sections, carefully dried and the dry matter determined in each, which is given in pounds per acre.

Dry matter of 1st cutting per acre, 4418.8 pounds.
Dry matter of 2d cutting per acre, 5218.3 pounds.
Dry matter of 3d cutting per acre, 4571.0 pounds.

The composition of the hays cut at different stages of maturity is shown in the tables on pages 21 and 22.

The composition of three different sections of the oat plant is also given in the same tables. These studies were made in order to determine at what distance from the ground the oats should be cut, as well as what loss occurs by leaving a long stubble. Some plants 3½ to 4 feet high were cut close to the ground and then divided into three sections, one of which was the first eight inches of the lower part of the stalk, another the second eight inches, and the third, the remainder of the plant or top. An inspection of the tables shows a marked difference in composition of the different sections. The bottom section has very little food value, containing only 2.77% protein and 1.90% fat, both of which are probably not more than 40% digestible. The second section has only about half the protein of the top section and its digestibility is probably less. It would, therefore, be advisable to leave a high stubble, not less than 8 to 10 inches of plants 3 to 4 feet high in harvesting, and the loss incurred by leaving the coarser part of the stalks on the ground will be more than compensated by the improved quality and palatability of the hay.

### OATS AS SILAGE.

Oats will make a very fair quality of silage when properly put in the silo, but the plant from the nature of its structure is not well adapted to the process of ensiling. The stalks being hollow carry, when not crushed or broken, a large amount of air into the mass which prolongs fermentation to the detriment of the quality of the silage. It therefore is necessary to run such materials through the silage cutter to obtain the best results. Although the plant is not an ideal one for the purpose, it is often desirable to put a field of oats into the silo on account of the presence of noxious weeds, rust, bad weather for drying at time of harvesting, or for other reasons. The station farm silos have several times been filled with this material. To avoid expense, the oats were at first put into the silo without cutting them in the silage cutter. All usual precautions of packing well at the sides and corners were observed in filling, and after full the silos were well covered, and weighted. In storing by this method, much of the silage spoiled and the remainder was not first quality. Subsequently the silos were filled several times with oats and peas run through the silage cutter, and the materials kept perfectly, coming out in green, nice condition and were as well relished by cattle as corn silage.

### OAT AND PEA HAY.

Oats and peas grown together and harvested when the oats are in the early milk stage make a forage crop very much superior to oats alone for either hay, soiling, or silage. As peas are a leguminous plant they increase the protein of the fodder, and also improve the soil by leaving behind, in their roots and stubble, a part of the nitrogen which they take from the air. By growing the mixture then, both the fodder and the soil are improved, whereas if oats are grown alone a rather poor fodder is obtained and the soil reduced in fertility. This combination makes one of the best soiling crops for feed in July and August before corn or Hungarian is mature enough to cut. If the crop is allowed to mature and the two grains are ground together, the result is a most excellent feed for dairy cows and is much used by Canadian farmers. The chief objection to the material for making hay is that it dries rather slowly. The pea vines are like clover in this respect and should be cured in much the same manner, in the windrow or cock. When well cured without too much exposure to moisture and sun it makes a fodder fully equal to our best English hay. In case of bad weather the silo can be resorted to as a means of caring for the crop, but the material should be run through a silage cutter before ensiling, otherwise it is liable to be poorly preserved. In sections of the State where corn cannot be grown on account of frosts, peas and oats make a valuable substitute with which to fill the silo. For composition and digestibility of oat and pea silage see pages 21-23.

The amount of seed to apply depends somewhat on the condition of the land and whether it is to be seeded to grass. The usual amounts sown are 1½ bushels oats and 1½ bushels peas to the acre, but several plots were grown on the Station farm with good success on fairly good soil, with a seeding of one bushel oats and two bushels peas to the acre. Three different varieties of peas were used and the yields of cured hay are given below.

Oat and Canada blue pea hay, 5,440 pounds to an acre.

Oat and Canada white pea hay, 5,408 pounds to an acre.

Oat and Mummy pea hay, 5,952 pounds to an acre.

For composition and digestibility see pages 21-23.

## BY-PRODUCTS OF THE OAT.

In the manufacture of oat products for human food, the kernel of the oat is separated from the hull. Oat hulls are in themselves, low in food value, being worth but little more than the same weight of oat straw. Their value may be materially greater if broken kernels or small oats are ground in with them. Manufacturers of oat products are putting ground oat hulls on the market in many forms and mixtures, such as oat feed, oat chop, corn and oat feed, chop, etc. The bulk of all these materials is ground oat hulls, with admixtures of oat kernels, ground corn, etc. The feeding value of them is variable, and they should never be bought except on a guaranteed composition, and then it should be remembered that the oat hulls are not as digestible as the kernel of oats or other grains. Unscrupulous dealers frequently sell "oat feeds" as ground oats, the unsuspecting buyer thinking he is getting the whole oat meal, which is much more valuable than most oat feeds.

Very few farmers can afford to buy feeds low in protein and high in carbohydrates at any price at which they have been or are likely to be offered. The farmer should grow all the coarse feeds that he needs. Oat and similar feeds are very much like corn stalks or oat straw in composition. Some of the feeds have cottonseed or other nitrogenous feeding stuffs added to them so that they carry more protein than straight oat feeds, but these mixtures are always more expensive sources of protein than are the glutens, cottonseed and linseed meals. One hundred pounds of an ordinary oat feed has from eight to eleven pounds protein. At seventy-five cents per hundred the protein costs from seven to nine cents a pound. One hundred pounds of a good gluten meal has from thirty-four to forty per cent of protein. At $1.30 per hundred the protein costs about three cents a pound and it not only costs less than half as much as that of the oat feed but it is better digested.

The tables which follow give the analyses of oat hays cut at different stages of growth, of different parts of the oat plant, of oat and pea and oat and vetch hays, and oats and oat products used in digestion experiments from which the digestion coefficients in the table on page 23 were obtained.

ANALYSES OF OAT PRODUCTS CALCULATED TO WATER CONTENT AT TIME OF SAMPLING.

| Kind of Material. | Station number. | Water. | Organic matter. | Ash. | Protein. | Fiber. | Nitrogen-free extract. | Fat. |
|---|---|---|---|---|---|---|---|---|
| Oat hay, cut when in bloom... | *4097 | 16.00 | 77.66 | 6.34 | 8.28 | 30.85 | 36.44 | 2.11 |
| Oat hay, cut when grain was in milk | *4096 | 16.00 | 78.67 | 5.23 | 8.89 | 26.49 | 40.66 | 2.73 |
| Oat hay, cut when grain was in dough | *4089 | 16.30 | 78.49 | 5.21 | 6.47 | 26.58 | 42.60 | 2.84 |
| Oat hay, cut when part of heads were in bloom, part in milk. | *4127 | 13.76 | 79.91 | 6.33 | 8.80 | 28.87 | 39.38 | 2.86 |
| Oat hay, cut when part of heads were in milk, part in dough. | *4130 | 13.28 | 80.47 | 6.25 | 6.59 | 29.45 | 41.13 | 3.30 |
| Oat hay, first 8 inch section of bottom of stalk... | 4134 | 9.80 | 84.03 | 6.17 | 2.50 | 39.23 | 40.58 | 1.72 |
| Oat hay, second 8 inch section of stalk | 4135 | 10.00 | 82.65 | 7.35 | 4.31 | 37.43 | 38.91 | 2.00 |
| Oat hay, top of plant. | 4133 | 11.33 | 82.45 | 6.22 | 8.53 | 24.68 | 45.88 | 3.36 |
| Oat and pea hay | *4174 | 14.50 | 77.51 | 7.99 | 14.41 | 26.84 | 33.69 | 2.57 |
| Oat and pea silage. | *4202 | 73.80 | 24.15 | 2.05 | 3.34 | 8.75 | 10.45 | 1.61 |
| Oat and vetch hay | *4217 | 20.00 | 73.93 | 6.07 | 8.51 | 24.93 | 37.68 | 2.81 |
| Oat and pea hay | *4222 | 25.08 | 68.99 | 5.93 | 10.31 | 25.01 | 31.45 | 2.22 |
| Oats. | *4145 | 11.15 | 85 93 | 2.92 | 12.56 | 11.28 | 57.70 | 4.39 |
| Oats | *4234 | 13.16 | 83.69 | 3.15 | 11.38 | 10.31 | 57.06 | 4.94 |
| Royal Oat Feed | *4245 | 10.37 | 83.90 | 5.73 | 6.69 | 22.39 | 51.74 | 3.08 |
| Oat straw. | 27 | 10.00 | 86.33 | 3.67 | 3.56 | 37.80 | 42.00 | 3.00 |
| Oat and Canada blue pea hay. | 4184 | 14.84 | 78.91 | 6.25 | 9.78 | 25.42 | 40.90 | 2.81 |
| Oat and Canada white pea hay | 4185 | 16.00 | 78.12 | 5.88 | 10.58 | 24.60 | 39.97 | 2.97 |
| Oat and mummy pea hay | 4186 | 14.83 | 79.70 | 5.47 | 9.21 | 25.72 | 41.86 | 2.91 |
| Oat and spring vetch hay | 4183 | 11.53 | 82.27 | 6.20 | 9.14 | 27.28 | 43.12 | 2.73 |

* The materials from which these samples were taken were used in the experiments from which the digestion coefficients in the table on page 23 were obtained.

ANALYSES OF OAT PRODUCTS CALCULATED TO DRY MATTER (WATER-FREE SUBSTANCE).

| Kind of Material. | Station number. | Dry matter. | Water-Free. Organic matter. | Ash. | Protein. | Fiber. | Nitrogen-free extract. | Fat. |
|---|---|---|---|---|---|---|---|---|
| | | % | % | % | % | % | % | % |
| Oat hay, cut when in bloom.. | *4097 | 73.54 | 92.45 | 7.55 | 9.86 | 36.70 | 43.38 | 2.51 |
| Oat hay, cut when grain was in milk | *4096 | 73.41 | 93.77 | 6.23 | 10.58 | 31.53 | 48.41 | 3.25 |
| Oat hay, cut when grain was in dough | *4089 | 83.70 | 93.77 | 6.23 | 7.73 | 31.74 | 50.91 | 3.39 |
| Oat hay, cut when part of heads were in bloom, part in milk | *4127 | 86.24 | 92.66 | 7.34 | 10.20 | 33.48 | 45.66 | 3.32 |
| Oat hay, cut when part of heads were in milk, part in dough | *4130 | 86.72 | 92.79 | 7.21 | 7.60 | 33.96 | 47.42 | 3.81 |
| Oat hay, first 8-inch section of bottom of stalk | 4134 | 90.20 | 93.16 | 6.84 | 2.77 | 43.49 | 45.00 | 1.90 |
| Oat hay, second 8-inch section of stalk | 4135 | 90.00 | 91.84 | 8.16 | 4.79 | 41.60 | 43.23 | 2.22 |
| Oat hay, top of plant | 4133 | 88.67 | 92.99 | 7.01 | 9.62 | 27.83 | 51.75 | 3.79 |
| Oat and pea hay | *4174 | 85.50 | 90.65 | 9.35 | 16.85 | 31.39 | 39.41 | 3.00 |
| Oat and pea silage | *4202 | 26.20 | 92.17 | 7.83 | 12.74 | 33.40 | 39.90 | 6.13 |
| Oat and vetch hay | *4217 | 80.00 | 92.41 | 7.59 | 10.64 | 31.16 | 47.10 | 3.51 |
| Oat and pea hay | *4222 | 74.92 | 92.09 | 7.91 | 13.76 | 33.38 | 41.99 | 2.96 |
| Oats | *4145 | 88.85 | 96.72 | 3.28 | 14.09 | 12.70 | 64.99 | 4.94 |
| Oats | *4234 | 86.84 | 96.37 | 3.63 | 13.10 | 11.87 | 65.71 | 5.69 |
| Royal Oat Feed | 4245 | 89.63 | 93.61 | 6.39 | 7.46 | 24.98 | 57.73 | 3.44 |
| Oat straw | 27 | 90.00 | 95.92 | 4.08 | 3.95 | 42.00 | 46.67 | 3.30 |
| Oat and Canada blue pea hay. | 4184 | 85.16 | 92.66 | 7.34 | 11.48 | 29.85 | 48.03 | 3.30 |
| Oat and Canada white pea hay | 4185 | 84.00 | 93.00 | 7.00 | 12.60 | 29.28 | 47.59 | 3.53 |
| Oat and mummy pea hay | 4186 | 85.17 | 93.58 | 6.42 | 10.81 | 30.20 | 49.15 | 3.42 |
| Oat and spring vetch hay | 4183 | 88.47 | 81.46 | 7.01 | 10.33 | 30.83 | 48.74 | 3.09 |

*The materials from which these samples were taken were used in the experiments from which the digestion coefficients in the table on page 23 were obtained.

### THE DIGESTIBILITY OF OAT PRODUCTS.

In additional to the chemical study of oats and oat products reported in the preceding tables, digestion experiments with sheep were made with the food materials the laboratory numbers of which are marked with the asterisk. The full data of these digestion experiments have been printed in previous publications of the Station. The final results of the coefficients thus obtained are given in the table which follows:

DIGESTION COEFFICIENTS OBTAINED FOR OAT PRODUCTS.

| | Station number. | Dry matter. | Organic matter. | Ash. | Protein. | Crude fiber. | Nitrogen-free extract. | Fat. |
|---|---|---|---|---|---|---|---|---|
| | | % | % | % | % | % | % | % |
| Oat hay, cut when in bloom... | 4097 | 54.3 | 53.7 | 48.6 | 53.5 | 59.9 | 51.2 | 48.3 |
| Oat hay, cut when grain was in milk ...................... | 4096 | 52.8 | 54.0 | 34.1 | 58.6 | 50.3 | 55.0 | 62.3 |
| Oat hay, cut when grain was in dough ................ ..... | 4089 | 53.8 | 54.8 | 41.0 | 44.7 | 49.4 | 59.1 | 64.5 |
| Oat hay, cut when part of heads were in bloom, part in milk .................... ...... | 4127 | 55.9 | 57.3 | 37.7 | 63.6 | 54.5 | 57.5 | 63.3 |
| Oat hay, cut when part of heads were in milk, part in dough ........................ | 4130 | 55.2 | 56.6 | 38.2 | 47.6 | 52.5 | 59.7 | 71.6 |
| Oat and pea hay ...... ........ | 4174 | 64.2 | 62.5 | 58.2 | 72.2 | 63.0 | 63.7 | 54.4 |
| Oat and pea silage ............ | 4202 | 65.5 | 66.6 | 52.4 | 74.6 | 61.3 | 67.0 | 75.0 |
| Oat and vetch hay ............ | 4217 | 60.1 | 60.2 | 60.2 | 69.5 | 51.5 | 62.7 | 73.8 |
| Oat and pea hay.. ............. | 4222 | 58.5 | 58.5 | 59.1 | 74.7 | 51.8 | 57.6 | 64.8 |
| Oats ........................... | 4145 | 69.2 | 71.3 | ...... | 75.5 | 30.8 | 77.2 | |
| Oats ........................... | 4234 | 71.5 | 72.5 | 44.5 | 78.9 | 31.2 | 77.3 | 89.3 |
| Royal Oat Feed................ | 4245 | 47.3 | 48.1 | 37.4 | 69.1 | 33.1 | 50.9 | 88.2 |

DIGESTIBLE NUTRIENTS IN DRY MATTER OF OAT PRODUCTS.

In order to compare the feeding values of different food materials, the digestible rather than the total nutrients must be taken into account. This is done in the following table which shows the percentage of digestible nutrients in the different oat products here reported upon.

The results of the experiments indicate that the nutrients of oat hay are in the most digestible form when the heads are in milk. If cut in bloom there is a less yield of poorer composition and digestibility than when cut in milk. If the cutting is delayed till the oats are in the dough stage, the slightly larger yield is more than offset by the poor quality and lessened digestibility of the hay.

| | Dry matter. | Organic matter. | Ash. | Protein. | Fiber. | Nitrogen-free extract. | Fat. |
|---|---|---|---|---|---|---|---|
| Oat hay, in bloom | 45.6 | 41.7 | 3.10 | 4.43 | 18.48 | 18.66 | 1.02 |
| Oat hay, in milk | 44.4 | 42.5 | 1.78 | 5.21 | 13.33 | 22.39 | 1.70 |
| Oat hay, in dough | 45.0 | 43.0 | 2.14 | 2.89 | 13.14 | 25.18 | 1.83 |
| Oat hay, bloom and milk | 48.2 | 45.8 | 2.39 | 4.80 | 15.75 | 22.66 | 1.80 |
| Oat hay, milk and dough | 47.9 | 45.6 | 2.39 | 3.14 | 15.49 | 24.54 | 2.36 |
| Oat and pea hay | 49.4 | 43.8 | 4.08 | 9.04 | 14.92 | 19.75 | 1.42 |
| Oat and pea silage | 17.2 | 16.1 | 1.07 | 2.49 | 5.36 | 6.67 | 1.21 |
| Oat and vetch hay | 48.1 | 44.4 | 3.65 | 5.61 | 12.82 | 23.64 | 2.06 |
| Oats | 62.1 | 60.7 | 1.40 | 8.99 | 3.21 | 44.14 | 4.41 |
| Royal Oat Feed | 42.6 | 40.4 | 2.14 | 4.63 | 7.41 | 26.34 | 2.72 |

# 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 of manufacturer or shipper, the percentage of crude protein, the percentage of crude fat. These statements may be printed directly on the bag, on a tag attached to the package, or on the back of the inspection tax tag furnished by the Director of the Station. 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.

MANUFACTURERS AND PLACE OF SAMPLING.

| Station number. | Manufacturer or Jobber. | Manufactured at | Sampled at |
|---|---|---|---|
| 9120 | American Cotton Oil Co | Greenville, S. C. | Biddeford |
| 9077 | American Cotton Oil Co | Wilmington, N. C. | Newport |
| 9090 | American Cotton Oil Co | Wilmington, N. C. | Palmyra |
| 9121 | American Cotton Oil Co | Macon, Ga | Gardiner |
| 9122 | American Cotton Oil Co | Memphis, Tenn | Newport |
| 9123 | American Cotton Oil Co | Memphis, Tenn | Hiram |
| 9124 | American Cotton Oil Co | Jackson, Tenn | Portland |
| 9125 | American Cotton Oil Co | Jackson, Tenn | Bridgton |
| 9126 | American Cotton Oil Co | Jackson, Tenn | Brunswick |
| 9127 | American Cotton Oil Co | Binkley, Ark | Hallowell |
| 9128 | American Cotton Oil Co | Binkley, Ark | Auburn |
| 9129 | American Cotton Oil Co | Binkley, Ark | Camden |
| 9130 | American Cotton Oil Co | Little Rock, Ark | Foxcroft |
| 9131 | American Cotton Oil Co | Little Rock, Ark | Westbrook |
| 9117 | American Cotton Oil Co | | Lewiston |
| 9104 | American Cotton Oil Co | | Corinna |
| 9083 | R. W. Biggs & Co | Memphis, Tenn | Athens |
| 9105 | R. W. Biggs & Co | Memphis, Tenn | East Newport |
| 9106 | R. W. Biggs & Co | Memphis, Tenn | East Newport |
| 9133 | R. W. Biggs & Co | Memphis, Tenn | Waterville |
| 9134 | R. W. Biggs & Co | Memphis, Tenn | Bangor |
| 9135 | R. W. Biggs & Co | Memphis, Tenn | Belfast |
| 9136 | R. W. Biggs & Co | Memphis, Tenn | Bath |
| 9149 | R. W. Biggs & Co | Memphis, Tenn | Richmond |
| 9151 | R. W. Biggs & Co | Memphis, Tenn | Brownfield |
| 9140 | F. W. Brodé & Co | Memphis, Tenn | Brunswick |
| 9141 | F. W. Brodé & Co | Memphis, Tenn | Pittsfield |
| 9142 | F. W. Brodé & Co | Memphis, Tenn | Augusta |
| 9143 | F. W. Brodé & Co | Memphis, Tenn | Belfast |
| 9102 | F. W. Brodé & Co | Memphis, Tenn | North Gorham |
| 9114 | Chapin & Co | St. Louis, Mo | East Fryeburg |
| 9119 | Chapin & Co | St. Louis, Mo | Readfield |
| 9144 | Chapin & Co | St. Louis, Mo | Augusta |
| 9145 | Chapin & Co | St. Louis, Mo | Dexter |
| 9146 | Chapin & Co | St. Louis, Mo | Bowdoinham |
| 9147 | Chapin & Co | St. Louis, Mo | Monmouth |
| 9148 | Chapin & Co | St. Louis, Mo | Skowhegan |
| 9154 | Chapin & Co | St. Louis, Mo | Portland |
| 9161 | Chapin & Co | St. Louis, Mo | Pittsfield |
| 9162 | Chapin & Co | St. Louis, Mo | Fryeburg |
| 9152 | A. R. Hopkins & Co | | South Brewer |
| 9150 | Butler, Breed Co | | Brunswick |
| 9089 | Humphreys, Goodwin & Co | Memphis, Tenn | Palmyra |
| 9107 | Humphreys, Goodwin & Co | Memphis, Tenn | East Newport |
| 9137 | Humphreys, Goodwin & Co | Memphis, Tenn | Waterville |
| 9138 | Humphreys, Goodwin & Co | Memphis, Tenn | Biddeford |
| 9139 | Humphreys, Goodwin & Co | Memphis, Tenn | Newport |
| 9155 | Hunter Brothers | St. Louis, Mo | Bangor |
| 9160 | Hunter Brothers | St. Louis, Mo | Portland |
| 9163 | Hunter Brothers | St. Louis, Mo | Belfast |
| 9132 | Independent Cotton Oil Co | Memphis, Tenn | South Paris |
| 9153 | J. E. Soper & Co | | Lewiston |

ANALYSES OF SAMPLES.

| Name of Feed. | Protein. Found—per cent. | Protein. Guaranteed—per cent. | Fat. Found—per cent. | Fat. Guaranteed—per cent. | Station number. |
|---|---|---|---|---|---|
| Prime Cotton Seed Meal | 45.69 | 41.50 | 10.18 | 9.00 | 9120 |
| Prime Cotton Seed Meal | 41.90 | 41.50 | 8.77 | 9.00 | 9077 |
| Prime Cotton Seed Meal | 43.50 | 41.00 | 9.03 | 9.00 | 9090 |
| Prime Cotton Seed Meal | 46.69 | 43.00 | 8.64 | 9.00 | 9121 |
| Prime Cotton Seed Meal | 44.69 | 43.00 | 9.55 | 9.00 | 9122 |
| Prime Cotton Seed Meal | 44.38 | 43.00 | 9.80 | 9.00 | 9123 |
| Prime Cotton Seed Meal | 46.06 | 43.00 | 9.50 | 9.00 | 9124 |
| Prime Cotton Seed Meal | 43.06 | 43.00 | 10.00 | 9.00 | 9125 |
| Prime Cotton Seed Meal | 44.25 | 43.00 | 10.42 | 9.00 | 9126 |
| Prime Cotton Seed Meal | 43.00 | 43.00 | 12.51 | 9.00 | 9127 |
| Prime Cotton Seed Meal | 44.38 | 43.00 | 11.27 | 9.00 | 9128 |
| Prime Cotton Seed Meal | 43.13 | 43.00 | 13.91 | 9.00 | 9129 |
| Prime Cotton Seed Meal | 44.25 | 43.00 | 9.86 | 9.00 | 9130 |
| Prime Cotton Seed Meal | 45.44 | 43.00 | 10.00 | 9.00 | 9131 |
| Prime Cotton Seed Meal | 45.00 | 43.00 | 10.79 | 9.00 | 9117 |
| Prime Cotton Seed Meal | 42.63 | 43.00 | 10.17 | 9.00 | 9104 |
| "Canary" Brand Cotton Seed Meal | 41.25 | 43.00 | 12.75 | 9.00 | 9083 |
| "Canary" Brand Cotton Seed Meal | 40.13 | 43.00 | 14.16 | 9.00 | 9105 |
| "Canary" Brand Cotton Seed Meal | 43.19 | 43.00 | 9.18 | 9.00 | 9106 |
| "Canary" Brand Cotton Seed Meal | 43.63 | 43.00 | 9.13 | 9.00 | 9133 |
| "Canary" Brand Cotton Seed Meal | 44.13 | 43.00 | 9.47 | 9.00 | 9134 |
| "Canary" Brand Cotton Seed Meal | 44.00 | 43.00 | 9.66 | 9.00 | 9135 |
| "Canary" Brand Cotton Seed Meal | 44.94 | 43.00 | 8.99 | 9.00 | 9136 |
| "Canary" Brand Cotton Seed Meal | 43.00 | 43.00 | 11.83 | 9.00 | 9149 |
| "Canary" Brand Cotton Seed Meal | 43.88 | 43.00 | 10.96 | 9.00 | 9151 |
| Owl Brand Pure Cotton Seed Meal | 44.38 | 43.00 | 8.76 | 9.00 | 9140 |
| Owl Brand Pure Cotton Seed Meal | 44.06 | 43.00 | 8.97 | 9.00 | 9141 |
| Owl Brand Pure Cotton Seed Meal | 45.88 | 43.00 | 9.28 | 9.00 | 9142 |
| Owl Brand Pure Cotton Seed Meal | 47.19 | 43.00 | 10.29 | 9.00 | 9143 |
| Owl Brand Pure Cotton Seed Meal | 46.88 | 43.00 | 9.65 | 9.00 | 9102 |
| Cotton Seed Meal | 41.88 | 43.00 | 9.26 | 9.00 | 9114 |
| Cotton Seed Meal | 40.63 | 43.00 | 10.53 | 9.00 | 9119 |
| Cotton Seed Meal | 46.81 | 43.00 | 8.48 | 9.00 | 9144 |
| Cotton Seed Meal | 46.81 | 43.00 | 9.57 | 9.00 | 9145 |
| Cotton Seed Meal | 44.00 | 43.00 | 8.64 | 9.00 | 9146 |
| Cotton Seed Meal | 46.50 | 43.00 | 9.74 | 9.00 | 9147 |
| Cotton Seed Meal | 46.38 | 43.00 | 9.93 | 9.00 | 9148 |
| Cotton Seed Meal | 46.19 | 43.00 | 11.11 | 9.00 | 9154 |
| Cotton Seed Meal | 44.50 | 43.00 | 9.84 | 9.00 | 9161 |
| Cotton Seed Meal | 42.06 | 43.00 | 9.18 | 9.00 | 9162 |
| Prime Cotton Seed Meal | 43.06 | 40.00 | 9.29 | 8.00 | 9152 |
| Cotton Seed Meal | 36.69 | 25.00 | 8.95 | 6.00 | 9150 |
| "Dixie" Brand Cotton Seed Meal | 43.50 | 43.00 | 11.22 | 9.00 | 9089 |
| "Dixie" Brand Cotton Seed Meal | 46.00 | 43.00 | 9.16 | 9.00 | 9107 |
| "Dixie" Brand Cotton Seed Meal | 44.88 | 43.00 | 9.52 | 9.00 | 9137 |
| "Dixie" Brand Cotton Seed Meal | 44.00 | 43.00 | 9.30 | 9.00 | 9138 |
| "Dixie" Brand Cotton Seed Meal | 45.63 | 43.00 | 10.67 | 9.00 | 9139 |
| Prime Cotton Seed Meal | 46.75 | 43.00 | 9.75 | 9.00 | 9155 |
| Prime Cotton Seed Meal | 45.63 | 43.00 | 8.67 | 9.00 | 9160 |
| Prime Cotton Seed Meal | 46.44 | 43.00 | 9.40 | 9.00 | 9163 |
| Prime Finely Ground Cotton Seed Meal | 45.69 | 43.00 | 13.75 | 9.00 | 9132 |
| Prime Cotton Seed Meal | 42.63 | 43.00 | 7.97 | 9.00 | 9153 |

MANUFACTURERS AND PLACE OF SAMPLING.

| Station number. | Manufacturer and Jobber. | Manufactured at | Sampled at |
|---|---|---|---|
| 9156 | ..................................... | ..................... | Auburn ............ |
| 9158 | ..................................... | ..................... | Readfield.......... |
| 9157 | ..................................... | ..................... | Dexter............. |
| 9159 | ..................................... | ..................... | Bath ............... |
| 9164 | ..................................... | ..................... | Norway............ |
| 9165 | Glucose Sugar Refining Co ..... | ..................... | Pittsfield .......... |
| 9166 | Glucose Sugar Refining Co . ... | ..................... | Camden ........... |
| 9167 | Glucose Sugar Refining Co ..... | ..................... | Bath................ |
| 9169 | Glucose Sugar Refining Co ..... | ..................... | Skowhegan ........ |
| 9172 | Glucose Sugar Refining Co ... . | ..................... | Waterville ......... |
| 9175 | Glucose Sugar Refining Co ..... | ..................... | Hallowell .......... |
| 9176 | Glucose Sugar Refining Co ..... | ..................... | Foxcroft ........... |
| 9168 | Glucose Sugar Refining Co ..... | ..................... | Biddeford .......... |
| 9170 | Glucose Sugar Refining Co ..... | ..................... | South Brewer...... |
| 9171 | Glucose Sugar Refining Co ..... | ..................... | Belfast............. |
| 9173 | Glucose Sugar Refining Co ..... | ..................... | Bridgton............ |
| 9174 | Glucose Sugar Refining Co ..... | ..................... | Auburn ............ |
| 9100 | Glucose Sugar Refining Co ..... | ..................... | North Yarmouth... |
| 9177 | Charles Pope Glucose Co ....... | ..................... | Waterville . ....... |
| 9178 | Charles Pope Glucose Co ...... | ..................... | Gardiner .......... |
| 9179 | Charles Pope Glucose Co ....... | ..................... | South Paris ........ |
| 9180 | Charles Pope Glucose Co ...... | ..................... | Orrington ......... |
| 9181 | Charles Pope Glucose Co ....... | ..................... | Westbrook ......... |
| 9182 | Charles Pope Glucose Co ...... | ..................... | Brunswick. ....... |
| 9183 | National Starch Manf'g Co .... | Des Moines, Iowa.. | Winthrop .......... |
| 9185 | National Starch Manf'g Co...... | Des Moines, Iowa . | Lewiston .......... |
| 9184 | National Starch Manf'g Co...... | Des Moines, Iowa . | Foxcroft . ......... |
| 9186 | National Starch Manf'g Co...... | Indianapolis, Ind.. | Hiram .............. |
| 9187 | National Starch Manf'g Co...... | Indianapolis, Ind.. | Dexter.............. |
| 9188 | National Starch Manf'g Co..... | Indianapolis, Ind.. | Augusta ........... |
| 9189 | National Starch Manf'g Co...... | Indianapolis, Ind.. | Bowdoinham ...... |
| 9190 | National Starch Manf'g Co...... | Glencove, L.I., N.Y. | Saco ............... |
| 9071 | Archer Starch Co ..... ......... | Bradley, Ill......... | South Berwick..... |
| 9191 | Glucose Sugar Refining Co ..... | ..................... | Biddeford .......... |
| 9192 | Glucose Sugar Refining Co .... | ..................... | Belfast.............. |
| 9196 | Glucose Sugar Refining Co . .. | ..................... | Waterville.......... |
| 9198 | Glucose Sugar Refining Co ..... | ..................... | Skowhegan ....... |
| 9193 | Glucose Sugar Refining Co ..... | ..................... | Camden ........... |
| 9194 | Glucose Sugar Refining Co .... | ..................... | Brunswick ......... |
| 9195 | Glucose Sugar Refining Co ..... | ..................... | Foxcroft ........... |
| 9197 | Glucose Sugar Refining Co . ... | ..................... | Waterville ......... |
| 9199 | Cleveland Linseed Oil Co....... | ..................... | Skowhegan ........ |
| 9200 | Cleveland Linseed Oil Co....... | ..................... | Rockland........... |
| 9201 | American Linseed Co. ......... | Chicago, Ill ........ | Brunswick ......... |
| 9202 | ..................................... | ..................... | Augusta............ |
| 9203 | ..................................... | ..................... | Augusta............ |
| 9205 | ..................................... | ..................... | Richmond . ....... |
| 9204 | American Milling Co .......... | Chicago, Ill ....... | Auburn ............ |
| 9206 | E. W. Blatchford & Co ......... | ..................... | Corinna ............ |
| 9207 | E. W. Blatchford & Co ......... | ..................... | Brunswick ......... |
| 9208 | W. H. Haskell & Co.............. | Toledo, Ohio. ..... | Portland .......... |
| 9209 | The Riverside Rolled Oats Co.. | Riverside, Iowa ... | Bath ............... |

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 | 46.13 | 43.00 | 96.40 | 9.00 | 9156 |
| Cotton Seed Meal | 46.44 | 43.00 | 10.29 | 9.00 | 9158 |
| Cotton Seed Meal | 47.75 | 46.12 | 9.93 | 9.20 | 9157 |
| Cotton Seed Meal | 46.19 | 46.12 | 10.29 | 9.20 | 9159 |
| Cotton Seed Meal | 47.44 | 46.12 | 9.56 | 9.20 | 9164 |
| Chicago Gluten Meal | 37.81 | 38.00 | 3.12 | 2.00 | 9165 |
| Chicago Gluten Meal | 35.19 | 38.00 | 2.56 | 2.00 | 9166 |
| Chicago Gluten Meal | 37.88 | 38.00 | 3.15 | 3.00 | 9167 |
| Chicago Gluten Meal | 40.56 | 38.00 | 3.36 | 2.00 | 9169 |
| Chicago Gluten Meal | 38.50 | 38.00 | 2.72 | 3.00 | 9172 |
| Chicago Gluten Meal | 39.44 | 38.00 | 3.20 | 3.00 | 9175 |
| Chicago Gluten Meal | 38.75 | 36.00 | 3.35 | 3.37 | 9176 |
| Chicago Gluten Meal | 35.56 | 39.50 | 3.06 | 3.37 | 9168 |
| Chicago Gluten Meal | 40.13 | 39.50 | 2.88 | 3.37 | 9170 |
| Chicago Gluten Meal | 39.44 | 39.50 | 3.31 | 3.37 | 9171 |
| Chicago Gluten Meal | 39.81 | 39.50 | 2.97 | 3.37 | 9173 |
| Chicago Gluten Meal | 36.06 | 39.50 | 2.70 | 3.37 | 9174 |
| Chicago Gluten Meal | 40.38 | .......... | 4.41 | ......... | 9100 |
| Cream Gluten Meal | 38.69 | 34.12 | 2.11 | 3.20 | 9177 |
| Cream Gluten Meal | 40.13 | 34.12 | 3.27 | 3.20 | 9178 |
| Cream Gluten Meal | 36.63 | 34.12 | 3.29 | 3.20 | 9179 |
| Cream Gluten Meal | 34.81 | 34.12 | 3.33 | 3.20 | 9180 |
| Cream Gluten Meal | 35.31 | 34.12 | 3.73 | 3.20 | 9181 |
| Cream Gluten Meal | 43.81 | 34.12 | 1.34 | 3.20 | 9182 |
| King Gluten Meal | 37.31 | 32.40 | 2.45 | 3.70 | 9183 |
| King Gluten Meal | 39.19 | 32.40 | 2.42 | 3.70 | 9185 |
| King Gluten Meal | 37.63 | 32.00 | 2.60 | 16.00 | 9184 |
| King Gluten Meal | 36.69 | 33.13 | 5.34 | 4.82 | 9186 |
| King Gluten Meal | 32.56 | 32.70 | 5.11 | 4.50 | 9187 |
| King Gluten Meal | 36.88 | 32.70 | 3.97 | 4.50 | 9188 |
| King Gluten Meal | 34.44 | 32.70 | 3.88 | 4.50 | 9189 |
| Gluten Feed | 27.69 | 28.40 | 3.65 | 4.30 | 9190 |
| Gluten Feed | 17.44 | ......... | 3.21 | ......... | 9071 |
| Germ Oil Meal | 22.06 | 25.50 | 13.99 | 10.50 | 9191 |
| Germ Oil Meal | 23.88 | 25.50 | 10.95 | 10.50 | 9192 |
| Germ Oil Meal | 23.50 | 25.50 | 13.05 | 10.50 | 9196 |
| Germ Oil Meal | 22.69 | 25.50 | 13.64 | 10.50 | 9198 |
| Germ Oil Meal | 24.50 | 25.00 | 9.03 | 3.00 | 9193 |
| Germ Oil Meal | 23.94 | 25.00 | 10.23 | 3.00 | 9194 |
| Germ Oil Meal | 21.25 | 25.00 | 12.25 | 3.00 | 9195 |
| Germ Oil Meal | 21.69 | 25.00 | 9.98 | 3.00 | 9197 |
| Linseed Oil Meal | 38.25 | 39.00 | 2.38 | 1.50 | 9199 |
| Cleveland Flax Meal | 39.25 | 39.00 | 2.81 | 1.50 | 9200 |
| Old Process Oil Meal | 31.94 | 32.00 | 7.71 | 5.00 | 9201 |
| Old Process Oil Meal | 33.38 | ......... | 6.70 | ......... | 9202 |
| Linseed Oil Meal | 37.56 | 38.00 | 2.31 | 1.00 | 9203 |
| Linseed Oil Meal | 38.44 | 38.00 | 2.56 | 1.00 | 9205 |
| Sucrene Oil Meal | 26.50 | 25.00 | 6.92 | 3.50 | 9204 |
| Blatchford's Calf Meal | 25.06 | 32.00 | 5.20 | 5.00 | 9206 |
| Blatchford's Calf Meal | 25.56 | 32.00 | 5.23 | 5.00 | 9207 |
| Oat Feed | 11.81 | 9.62 | 9.46 | 7.66 | 9208 |
| Puritan Oat Feed | 13.81 | ....... | 6.04 | .......... | 9209 |

MANUFACTURERS AND PLACE OF SAMPLING.

| Station number. | Manufacturer or Jobber. | Manufactured at | Sampled at |
|---|---|---|---|
| 9210 | American Cereal Co | Chicago, Ill | Westbrook |
| 9211 | American Cereal Co. | Chicago, Ill. | Rockland |
| 9212 | American Cereal Co. | Chicago, Ill. | Augusta |
| 9213 | American Cereal Co. | Chicago, Ill. | Foxcroft |
| 9214 | American Cereal Co. | Chicago, Ill. | Brunswick |
| 9215 | American Cereal Co. | Chicago, Ill. | Skowhegan |
| 9216 | American Cereal Co. | Chicago, Ill. | Hiram |
| 9217 | American Cereal Co. | Chicago, Ill. | Lewiston |
| 9055 | American Cereal Co. | Chicago, Ill. | Waldoboro |
| 9218 | American Cereal Co. | Chicago, Ill. | Bath |
| 9219 | American Cereal Co. | Chicago, Ill. | Hiram |
| 9220 | American Cereal Co. | Chicago, Ill. | Brunswick |
| 9221 | American Cereal Co. | Chicago, Ill. | Augusta |
| 9222 | American Cereal Co. | Chicago, Ill. | Belfast |
| 9223 | American Cereal Co. | Chicago, Ill. | Skowhegan |
| 9224 | ........ | ........ | Foxcroft |
| 9225 | O. Holway Co | Auburn | Waterville |
| 9226 | Husted Milling & Elevator Co. | Buffalo, N. Y | Brownfield |
| 9227 | Hunter Bros | St. Louis, Mo. | Auburn |
| 9228 | Hunter Bros | St. Louis, Mo. | Winthrop |
| 9229 | ........ | ........ | Dexter |
| 9292 | ........ | ........ | Castle Hill |
| 9239 | ........ | ........ | Monmouth |
| 9233 | American Cereal Co. | Chicago, Ill. | Richmond |
| 9230 | Muscatine Oat Meal Co | Muscatine, Iowa | Biddeford |
| 9231 | Muscatine Oat Meal Co | Muscatine, Iowa | Westbrook |
| 9232 | Muscatine Oat Meal Co | Muscatine, Iowa | Rockland |
| 9234 | The H-O Company | Buffalo, N. N | Freeport |
| 9235 | The H-O Company | Buffalo, N. Y | Freeport |
| 9236 | The American Cereal Co | Chicago, Ill. | Westbrook |
| 9237 | The American Cereal Co | Chicago, Ill. | Brunswick |
| 9238 | M. L. Crittenden | Buffalo, N. Y | Portland |
| 9240 | The Bowker Co | Boston, Mass. | Freeport |
| 9241 | The Bowker Co | Boston, Mass. | Gardiner |
| 9242 | The Bowker Co | Boston, Mass. | Brunswick |
| 9243 | The Bowker Co | Boston, Mass. | Camden |
| 9244 | The Bowker Co | Boston, Mass. | Brunswick |
| 9245 | The Bowker Co | Boston, Mass. | Richmond |
| 9246 | The Bowker Co | Boston, Mass. | Freeport |
| 9247 | The Bradley Fertilizer Co | Boston, Mass. | Portland |
| 9248 | ........ | ........ | Portland |
| 9249 | Armour Fertilizer Works | Chicago, Ill. | Portland |
| 9251 | Henderson Milling Co. | Henderson, Ky | Fryeburg |
| 9252 | ........ | ........ | Brunswick |
| 9253 | Kentucky Milling Co | Henderson, Ky | Bowdoinham |
| 9254 | Kentucky Milling Co | Henderson, Ky | Corinna |
| 9250 | American Cereal Co. | Chicago, Ill. | Camden |

ANALYSES OF SAMPLES.

| Name of feed. | Protein. Found—per cent. | Protein. Guaranteed—per cent. | Fat. Found—per cent. | Fat. Guaranteed—per cent. | Station number. |
|---|---|---|---|---|---|
| Vim Oat Feed | 7.13 | 6.50 | 2.90 | 2.50 | 9210 |
| Quaker Dairy Feed | 12.56 | 12.03 | 3.36 | 2.50 | 9211 |
| Quaker Dairy Feed | 13.13 | 12.03 | 3.28 | 2.50 | 9212 |
| Quaker Dairy Feed | 12.63 | 12.03 | 3.07 | 2.50 | 9213 |
| Quaker Dairy Feed | 13.69 | 12.03 | 3.26 | 2.50 | 9214 |
| Quaker Dairy Feed | 11.31 | 12.03 | 2.68 | 2.50 | 9215 |
| Quaker Dairy Feed | 14.31 | 12.03 | 3.73 | 2.50 | 9216 |
| Quaker Dairy Feed | 12.13 | 12.03 | 2.97 | 2.50 | 9217 |
| Quaker Oat Feed | 11.25 | 12.03 | 4.57 | 2.50 | 9055 |
| Victor Corn and Oat Feed | 9.25 | 8.23 | 3.23 | 3.00 | 9218 |
| Victor Corn and Oat Feed | 10.13 | 8.23 | 4.89 | 3.00 | 9219 |
| Victor Corn and Oat Feed | 9.69 | 8.23 | 4.33 | 3.00 | 9220 |
| Victor Corn and Oat Feed | 9.31 | 8.23 | 3.30 | 3.00 | 9221 |
| Victor Corn and Oat Feed | 9.00 | 8.23 | 4.00 | 3.00 | 9222 |
| Victor Corn and Oat Feed | 9.31 | 8.23 | 3.26 | 3.00 | 9223 |
| Monarch Corn and Oat Feed | 10.50 | ......... | 6.45 | ......... | 9224 |
| Monarch Corn and Oat Feed | 11.06 | 10.25 | 8.04 | 7.47 | 9225 |
| Monarch Chop Feed | 8.56 | 9.19 | 3.72 | 3.45 | 9226 |
| Ned Chops | 11.25 | ......... | 6.24 | ......... | 9227 |
| Ned Chops | 10.94 | 10.25 | 7.17 | 7.47 | 9228 |
| Corn and Oat Feed | 11.88 | ......... | 3.34 | ......... | 9229 |
| Corn and Oat Feed | 9.63 | 10.81 | 3.89 | 6.02 | 9292 |
| Corn and Oat Chop | 10.00 | ......... | 5·50 | ......... | 9239 |
| Shumacher's Stock Feed or Corn, Oats and Barley | 12.13 | 10.79 | 4.98 | 3.28 | 9233 |
| Friend's Concentrated Dairy Food | 8.13 | 10.70 | 7.15 | 3.70 | 9230 |
| Friend's Concentrated Dairy Food | 8.75 | ......... | 3.39 | ......... | 9231 |
| Friend's Concentrated Dairy Food | 8.13 | 10.70 | 3.28 | 3.70 | 9232 |
| The H-O Co.'s Dairy Feed | 17.88 | 18.00 | 3.84 | 4.50 | 9234 |
| The H-O Co.'s Horse Feed | 13.44 | 12.00 | 4.66 | 4.50 | 9235 |
| American Poultry Food | 13.63 | 13.96 | 6.74 | 5.48 | 9236 |
| American Poultry Food | 13.81 | 13.96 | 6.80 | 5.48 | 9237 |
| Sterling Provender | 8.75 | 8.82 | 3.81 | 5.55 | 9238 |
| Bowker's Animal Meal | 36.13 | 30.00 | 10.37 | 5.00 | 9240 |
| Bowker's Animal Meal | 39.06 | 30.00 | 8.49 | 5.00 | 9241 |
| Bowker's Animal Meal | 38.31 | 30.00 | 8.79 | 5.00 | 9242 |
| Bowker's Animal Meal | 41.00 | 30.00 | 8.29 | 5.00 | 9243 |
| Bowker's Ground Beef Scraps | 52.06 | ......... | 18.15 | ......... | 9244 |
| Bowker's Ground Beef Scraps | 49.19 | 30.00 | 15.40 | 20.00 | 9245 |
| Bowker's Ground Beef Scraps | 54.25 | 30.00 | 19.42 | 20.00 | 9246 |
| Bradley's Superior Meat Meal | 51.69 | 40.00 | 9.48 | 8.00 | 9247 |
| Ground Beef Scraps for Poultry | 66.81 | 50.00 | 13.10 | 9.00 | 9248 |
| Meat Meal | 63.19 | 60.00 | 15.23 | 13.00 | 9249 |
| Kentucky Mixed Feed | 13.75 | 12.00 | 3.79 | 3.00 | 9251 |
| Purity Mixed Feed | 13.88 | ......... | 4.12 | ......... | 9252 |
| Jersey Mixed Feed | 12.63 | 11.50 | 3.83 | 3.50 | 9253 |
| Jersey Mixed Feed | 14.63 | ......... | 4.03 | ......... | 9254 |
| Buckeye Wheat Feed | 18.94 | 16.21 | 4.76 | 4.48 | 9250 |

SUMMARY OF ANALYSES.

| | Number of analyses. | | Protein. Found—per cent. | Protein. Guaranteed—per cent. | Fat. Found—per cent. | Fat. Guaranteed—per cent. |
|---|---|---|---|---|---|---|
| American Cotton Oil Co.'s Prime Cotton Seed Meal. | 16 | Highest | 46.69 | ......... | 13.91 | |
| | | Lowest | 42.63 | *43.00 | 8.64 | 9.00 |
| | | Average | 44.25 | .......... | 10.25 | |
| R. W. Biggs & Co.'s "Canary" Brand Cotton Seed Meal. | 9 | Highest | 44.94 | .... .... | 14.16 | |
| | | Lowest | 40.13 | 43.00 | 8.99 | 9.00 |
| | | Average | 43.13 | ......... | 10.68 | |
| F. W. Brodé & Co.'s Owl Brand Cotton Seed Meal. | 5 | Highest | 47.19 | ... ...... | 10.29 | |
| | | Lowest | 44.06 | 43.00 | 8.76 | 9.00 |
| | | Average | 45.68 | .......... | 9.39 | |
| Chapin & Co.'s Cotton Seed Meal. | 10 | Highest | 46.81 | ......... | 11.11 | |
| | | Lowest | 40.63 | 43.00 | 8.48 | 9.00 |
| | | Average | 44.58 | .......... | 9.63 | |
| A. R. Hopkins & Co.'s Prime Cotton Seed Meal. | 1 | .......... | 43.06 | 40.00 | 9.29 | 8.00 |
| Butler, Breed Co.'s Cotton Seed Meal. | 1 | ............ | 36.69 | 25.00 | 8.95 | 6.00 |
| Humphreys, Goodwin & Co.'s "Dixie" Brand Cotton Seed Meal. | 5 | Highest | 46.00 | ...... .... | 11.22 | |
| | | Lowest | 43.50 | 43.00 | 9.16 | 9.00 |
| | | Average | 44.80 | ........ | 9.97 | |
| Hunter Brother's Prime Cotton Seed Meal. | 3 | Highest | 46.75 | .... ... | 9.75 | |
| | | Lowest | 45.63 | 43.00 | 8.67 | 9.00 |
| | | Average | 46.27 | .......... | 9.27 | |
| Independent Cotton Oil Co.'s Prime Finely Ground Cotton Seed Meal. | 1 | ............ | 45.69 | 43.00 | 13.75 | 9.00 |
| J. E. Soper & Co.'s Prime Cotton Seed Meal. | 1 | ............ | 42.63 | 43.00 | 7.97 | 9.00 |
| Manufacturers unknown Cotton Seed Meal. | 2 | Highest | 46.44 | .......... | 10.29 | |
| | | Lowest | 46.13 | 43.00 | 9.64 | 9.00 |
| | | Average | 46.29 | .... .... | 9.27 | |
| Manufacturers unknown Cotton Seed Meal. | 3 | Highest | 47.75 | .......... | 10.29 | |
| | | Lowest | 46.19 | 46.12 | 9.56 | 9.20 |
| | | Average | 47.13 | ........ | 9.93 | |
| Summary of all high grade cotton seed meals analyzed. | 56 | Highest | 47.75 | 46.10 | 14.16 | |
| | | Lowest | ‡40.13 | 41.00 | .... . ... | |
| | | Average | 44.62 | ... ...... | 10.05 | |
| Low grade cotton seed meal. | 1 | .. .. ..... | 36.69 | 25.00 | 8.95 | 6.00 |
| Glucose Sugar Refining Co.'s Chicago Gluten Meal. | 13 | Highest | 40.56 | 39.50 | 4.41 | 3.37 |
| | | Lowest | 35.19 | 38.00 | 2.70 | 3.00 |
| | | Average | 38.44 | 36.00 | 3.14 | 2.00 |
| Charles Pope Glucose Co.'s Cream Gluten Meal. | 6 | Highest | 43.81 | ......... | 3.73 | |
| | | Lowest | 34.81 | 34.12 | 1.34 | 3.20 |
| | | Average | 38.23 | ........ | 2.84 | |

* One sample guaranteed 41.50 carried 41.90 per cent of protein.

‡ One sample only guaranteed to carry 25 per cent of protein had 36.69 per cent protein.

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. | 7 | Highest | 39.19 | 32.40 | 5.34 | 3.07 |
| | | Lowest | 32.56 | 32.00 | 2.42 | 16.00 |
| | | Average | 36.39 | 33.13 | 3.68 | 4.82 |
| | | | | 32.70 | | 4.05 |
| National Starch Manf'g Co.'s Gluten Feed. | 1 | ............ | 27.69 | 28.40 | 3.65 | 4.30 |
| The Archer Starch Co.'s Gluten Feed. | 1 | ........... | 17.44 | .......... | 3.21 | |
| Glucose Sugar Refining Co.'s Germ Oil Meal. | 8 | Highest | 24.50 | 25.50 | 13.99 | 10.50 |
| | | Lowest | 21.25 | 25.00 | 9.03 | 3.00 |
| | | Average | 22.94 | .......... | 10.39 | |
| The Cleveland Linseed Oil Co.'s Linseed Oil Meal. | 1 | ... ....... | 38.25 | 39.00 | 2.38 | 1.50 |
| The Cleveland Linseed Oil Co.'s Cleveland Flaxmeal. | 1 | ...... ... | 39.25 | 39.00 | 2.81 | 1.50 |
| American Linseed Co.'s Old Process Oil Meal. | 1 | ........... | 31.94 | 32.00 | 7.71 | 5.00 |
| American Milling Co.'s Sucrene Oil Meal. | 1 | .......... | 26.50 | 25.00 | 6.92 | 3.50 |
| E. W. Blatchford & Co.'s Blatchford's Calf Meal. | 2 | Highest | 25.56 | ......... | 5.23 | |
| | | Lowest | 25.06 | 32.00 | 5.20 | 5.00 |
| | | Average | 25.31 | .......... | 5.22 | |
| W. H. Haskell & Co's Oat Feed. | 1 | ..... ...... | 11.81 | 9.62 | 9.46 | 7.66 |
| Riverside Rolled Oats Co.'s Puritan Oat Feed. | 1 | ............ | 13.81 | .......... | 6.04 | |
| American Cereal Co.'s Vim Oat Feed. | 1 | ..... ...... | 7.13 | 6.50 | 2.90 | 2.50 |
| American Cereal Co.'s Quaker Dairy Feed. | 7 | Highest | 14.31 | ...... .. | 3.73 | |
| | | Lowest | 11.31 | 12.03 | 2.68 | 2.50 |
| | | Average | 12.82 | .......... | 3.19 | |
| American Cereal Co.'s Quaker Oat Feed. | 1 | .. ........ | 11.25 | 12.03 | 4.57 | 2.50 |
| American Cereal Co.'s Victor Corn and Oat Feed. | 6 | Highest | 10.13 | .......... | 4.89 | |
| | | Lowest | 9.00 | 8.23 | 3.23 | 3.00 |
| | | Average | 9.45 | ...... .... | 3.84 | |
| O. Holway Co.'s Monarch Corn and Oat Feed. | 2 | Highest | 11.06 | .......... | 8.04 | |
| | | Lowest | 10.50 | 10.25 | 6.45 | 7.47 |
| | | Average | 10.78 | ......... | 7.25 | |
| Husted Milling & Elevator Co.'s Monarch Chop Feed. | 1 | ............ | 8.56 | 9.19 | 3.72 | 3.45 |
| Hunter Brothers' Ned Chops. | 2 | Highest | 11.25 | .......... | 7.17 | |
| | | Lowest | 10.94 | 10.25 | 6.24 | 7.47 |
| | | Average | 11.10 | ... ...... | 6.71 | |
| American Cereal Co.'s Schumacher's Stock Feed or Corn, Oats and Barley. | 1 | ..... ...... | 12.13 | 10.79 | 4.98 | 3.28 |

SUMMARY OF ANALYSES—CONCLUDED.

| | Number of analyses. | | Protein. Found—per cent. | Protein. Guaranteed—per cent. | Fat. Found—per cent. | Fat. Guaranteed—per cent. |
|---|---|---|---|---|---|---|
| The Muscatine Oat Meal Co.'s Friend's Conc'nt'd Dairy Food | 3 | Highest<br>Lowest<br>Average | 8.75<br>8.13<br>8.34 | .........<br>10.70<br>......... | 7.15<br>3.28<br>4.61 | 3.77 |
| The H-O Company's Dairy Feed. | 1 | ........... | 17.88 | 18.00 | 3.84 | 4.50 |
| The H-O Company's Horse Feed. | 1 | ........... | 13.44 | 12.00 | 4.66 | 4.50 |
| American Cereal Co.'s American Poultry Food. | 2 | Highest<br>Lowest<br>Average | 13.81<br>13.63<br>13.72 | ..........<br>13.96<br>.......... | 6.80<br>6.74<br>6.77 | 5.48 |
| M. L. Crittenden's Sterling Provender. | 1 | ............ | 8.75 | 8.82 | 3.81 | 5.55 |
| The Bowker Co.'s Bowker's Animal Meal. | 4 | Highest<br>Lowest<br>Average | 41.00<br>36.13<br>38.63 | .........<br>30.00<br>......... | 10.37<br>8.29<br>8.99 | 5.00 |
| The Bowker Co.'s Bowker's Ground Beef Scraps | 3 | Highest<br>Lowest<br>Average | 54.25<br>49.19<br>51.83 | .........<br>30.00<br>.......... | 18.15<br>15.40<br>17.66 | 20.00 |
| The Bradley Fertilizer Co.'s Bradley's Superior Meat Meal | 1 | ........... | 51.69 | 40.00 | 9.48 | 8.00 |
| Manufacturer's unknown Ground Beef Scraps for Poult. | 1 | ........... | 66.81 | 50.00 | 13.10 | 9.00 |
| Armour Fertilizer Works Meat Meal. | 1 | ............ | 63.19 | 60.00 | 15.23 | 13.00 |
| Henderson Milling Co.'s Kentucky Mixed Feed. | 1 | .......... | 13.75 | 12.00 | 3.79 | 3.00 |
| Manufacturers unknown Purity Mixed Feed. | 1 | ........... | 13.88 | ......... | 4.12 | |
| Kentucky Milling Co.'s Jersey Mixed Feed. | 2 | Highest<br>Lowest<br>Average | 14.63<br>12.63<br>13.63 | ..........<br>11.50<br>......... | 4.03<br>3.83<br>3.93 | 3.50 |
| American Cereal Co.'s Buckeye Wheat Feed. | 1 | ........... | 18.94 | 16.21 | 4.76 | 4.48 |

ANALYSES OF BRANS AND MIXED FEEDS COLLECTED IN 1900.

| Station number. | Manufacturer or dealer. | Sampled at | Name of Feed. | Protein—per cent. |
|---|---|---|---|---|
| 9255 | Acme Milling Co | Augusta | Acme Mixed Feed | 17.56 |
| 9256 | Alma Roller Mills | Freeport | Straight Alma Mixed Feed | 16.69 |
| 9257 | Austed & Burke | Dexter | Mixed Feed | 17.25 |
| 9258 | Berger, Anderson & Co | Saco | Badger Mixed Feed | 18.56 |
| 9259 | Blish Milling Co | Foxcroft | Winter Wheat Mixed Feed | 18.13 |
| 9263 | Chapin & Co | Skowhegan | Mixed Feed | 15.63 |
| 9260 | Doten Grain Co | Portland | Royal Mixed Feed | 17.38 |
| 9261 | Hunter Bros | South Brewer | Hunter Bros.' Mixed Feed. | 17.75 |
| 9262 | J. Jencks | Skowhegan | Winter Wheat Mixed Feed. | 15.56 |
| 9264 | Lawrenceburg Roller Mills Co | South Brewer | Snow Flake Mixed Feed | 17.88 |
| 9265 | R. P. Moore Milling Co | Brunswick | King Feed, Pure Bran and Middlings | 18.25 |
| 9078 | Portland Milling Co | Newport | Champion Mixed Feed | 15.25 |
| 9088 | Portland Milling Co | Newport | Champion Mixed Feed | 16.94 |
| 9266 | Portland Milling Co | Waterville | Champion Mixed Feed | 16.31 |
| 9267 | Rex Milling Co. | Bowdoinham | Mixed Feed | 17.56 |
| 9268 | The Shelby Mill Co | Bath | Mixed Feed | 17.88 |
| 9269 | F. W. Stock | Norway. | M. F. Mixed Feed | 16.88 |
| 9270 | David Stott | Waterville | Stott's Mixed Feed | 16.50 |
| 9271 | Valley City Milling Co | Richmond | Farmers Favorite Mixed Winter Wheat Cow Feed. | 17.44 |
| 9272 | Valley City Milling Co | Waterville | Farmers Favorite Mixed Winter Wheat Cow Feed. | 16.25 |
| 9273 | Zenith Milling Co | Bowdoinham | Mixed Feed | 17.81 |
| 9274 | L. P. Snow | Brunswick | Mixed Feed | 16.25 |
| 9275 | Hunter, MacMaster Co | Pittsfield | Mixed Feed | 13.50 |
| 9276 | L. N. Littlehale | Rockland | Faist's Mixed Feed | 18.19 |
| 9277 | H. C. Morse | Waterville | Mixed Feed | 16.56 |
| 9070 | C. B. Cummings & Son | Norway | Mixed Feed | 12.56 |
| 9074 | C. A. S. Holland | Portland | Mixed Feed | 16.06 |
| 9081 | | Kennebunk | Kansas Feed | 18.56 |
| 9084 | Steward Bros | Skowhegan | Fancy Mixed Feed | 15.06 |
| 9108 | Judkins & Gilman | East Newport | Ground Wheat Feed | 18.25 |
| 9278 | Austed & Burke | Camden | Bran Best Flour Wm. Tell Bob White Golden Fleece | 16.31 |
| 9279 | W. A. Coomb's Mills | Dexter | Winter Wheat Bran | 16.38 |
| 9280 | Schultz, B. & Co | Foxcroft | Bran | 15.81 |
| 9086 | David Stott | Newport | Stott's Pure Winter Wheat Bran | 15.81 |
| 9109 | David Stott | East Newport | Stott's Pure Winter Wheat Bran | 15.13 |
| 9281 | David Stott | Foxcroft | Stott's Pure Winter Wheat Bran | 15.94 |
| 9282 | Valley City Milling Co | Skowhegan | Michigan Winter Wheat Bran | 17.56 |
| 9283 | Voigt Milling Co. | Skowhegan | Voigt's Choice Winter Wheat Bran | 17.00 |
| 9284 | E. S. Woodworth Co | Norway. | Snow's Flaky Bran | 16.94 |
| 9285 | Pillsbury's Mill | Foxcroft | Pillsbury's Bran | 16.31 |
| 9286 | R. H. Soule & Co | South Windham | Ballard's Bran | 16.94 |
| 9079 | | Newport | Bran | 15.81 |
| 9087 | J. F. Longley | Newport | Bran | 16.81 |
| 9103 | Washburn Crosby | North Gorham | Bran | 16.13 |
| 9111 | F. W. Stock | Corinna | Bran | 15.69 |
| 9287 | Washburn Crosby Co | Augusta | Standard Middlings | 19.13 |

### COTTONSEED MEAL.

Pure cottonseed meal is made by grinding the seed after the white down, which remains upon the seed as it comes from the cotton gin, and the hard hulls have been removed. Thus prepared, cottonseed meal may carry from 40 to 53 per cent of protein. The analyses of 57 samples are reported. The guarantees for the high grade cottonseed meal varied from 41 per cent of protein and 9 per cent of fat to 46.12 per cent protein and 9.2 per cent fat. The lowest protein found was 40.13 per cent and the lowest fat 7.97 per cent. The averages are considerably above the guaranteed percentages.

Only 6 of the 57 samples were below guarantee in protein. One sample was nearly 3 per cent below in protein but the fat was 5 per cent above the guarantee, thus indicating that the falling off in protein was due to the imperfect removal of the fat and not to poor seed or the addition of adulterants. The other 5 samples fell less than 2 per cent below the guaranteed protein.

Only one sample of low grade cottonseed meal was found by the inspector and none have been received from correspondents. At the first inspection under the law (December, 1897) 12 samples of low grade unguaranteed cottonseed meals carrying from 20 to 30 per cent of protein were found. If the law regulating the sale of concentrated commercial feeding stuffs has accomplished nothing else, this driving low grade cottonseed meal out of the Maine market is worth to the agriculture of the State more than the cost of inspection.

### GLUTEN MEALS AND FEEDS.

Gluten meals and gluten feeds are by-products left in the manufacture of starch and glucose from Indian corn. Corn consists largely of starch. The waste product from the manufacture of starch or sugar is relatively much richer in oil and protein than corn. Most factories are removing part of the corn oil from the waste, so that nearly all the gluten meals carry but little oil, e. g., Chicago Gluten Meal, which two years ago carried 7 to 9 per cent of fat, now has from 2.50 to 4 per cent. This reduction in fat is probably an advantage, as feeding corn oil to dairy animals seems to have a tendency to make softer butter.

Chicago Gluten Meal was as in the past found at many places. Three different guarantees were found on the different lots, ranging from 36 to 39.5 per cent in protein and from 2 to 3.37 per cent in fat. The more common guarantee is that given by the State agents—protein 38 per cent and fat 2 per cent. The average of the 13 samples examined was protein 38.44 per cent and fat 3.14 per cent.

Cream Gluten, made by the Chas. Pope Glucose Co., carries the same guarantee as in the past, 34.12 per cent protein and 3.20 per cent fat. They have evidently changed the process of manufacture, for the goods are much improved in protein content. Eleven samples taken in December, 1899, carried from 30.31 to 34.94 per cent protein, with an average of 32.99 per cent. Six samples collected in December, 1900, carry 34.81 per cent (almost the same as the highest in 1899) to 43.81 and the 6 samples taken in December, 1900, average 38.23 per cent, or over 5 per cent more protein than in 1899. The fat content remains practically unchanged. In composition the goods very closely resemble Chicago Gluten Meal.

A year ago part of the King Gluten Meal carried nearly 16 per cent of fat. The King Gluten Meal now found in the State has a fat content ranging from 2.42 per cent to 5.34 with an average of 3.68 per cent. None of the goods correspond in fat to the original guarantee (16 per cent) found on occasional lots. The goods carry on the average (7 samples) 36.39 per cent protein and 3.68 per cent fat, rather more fat and 2 per cent less protein than either Chicago or Cream Gluten.

Very little gluten feed is used in the State. The Natural Starch Manufacturing Company's gluten feed (1 sample) agrees fairly well with the guarantees. One unguaranteed lot of very poor gluten feed, made by the Auburn Starch Company of Bradley, Ill., was found at Brewer. Very little of this brand has been sold.

Germ Oil Cake, a corn product, is quite generally distributed in the State. It is sold at a somewhat less price than gluten meal. In no case does it come up to the guaranteed protein. On the average the 8 samples carried 2 per cent less protein than the more common guarantee of 25 per cent. As a source of protein it is about as good as rather poor gluten feed and has less than two-thirds the value of good gluten meal. Only one sample of Sucrene oil meal was found. It carried more of protein and fat than called for by the guarantees. In composition it resembles a good gluten feed.

### OAT FEEDS. CORN CHOPS.

The various oat feeds, corn chops and corn and oat feeds are still used in the State to a large extent. Some of these are the straight refuse from the manufacture of oat meal and others like the H-O Company's goods are mixtures of such refuse with other by-products of higher protein content. They are all well up to their respective guarantees and no fault can be found with the manufacturers for their desire to sell these goods, as they are making no claims for nutrients which the goods do not contain. The intelligent buyer of feeding stuffs, who has his barns well filled with hay, corn fodder and silage, will have very little use for these feeds low in protein content.

The value of by-products of the oat as cattle foods has been discussed in bulletin 70 of this Station.

### ADULTERATED BRANS. MIXED FEEDS.

Bulletin 63 published in April, 1900, contained the following:

"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."

These goods are still being sold in the State (one concern having bought tax tags for 1,500 tons since March, 1900), but they are sold under the law and the purchaser knows from the guarantee what the goods are. These so-called mixed feeds carry more protein and fat than the guarantees call for. If the users of these foods are not getting a fair value for their money, they alone are at fault. The law is doing in this instance exactly what it was intended to do. It does not prohibit the sale of such goods but makes it so that they must be offered on their merits.

## WHEAT BRAN AND MIDDLINGS—MIXED FEED.

The refuse products in the milling of wheat are very important cattle foods. With the exception of Indian corn, whole and ground, there is probably no other class of foods used so largely in this State as food for dairy stock. "Wheat, rye and buckwheat brans or middlings, not mixed with other substances, but sold separately, as distinct articles of commerce" are, under the law, exempt from inspection. In order that the character of these feeds might be investigated, soon after the law went into effect the Station analyzed a large number of the wheat offals which were being sold in the State. As this class of feeds are, in addition to their mineral matters, of chief importance as a source of nitrogen, only the protein was determined in them. All suspicious samples were examined under the microscope, but in no instance was foreign matter found that indicated adulteration. In a few cases oat and barley hulls were observed but in no greater amount than sometimes occurs in wheat.

As the result of this study and after consultation with the Secretary of the Board of Agriculture it was decided that the spirit of the law would not be broken if all wheat offals should be considered as exempt from its requirements, even though they might be called mixed feeds.

As noted elsewhere in this bulletin, in the fall of 1899 it was found by samples sent from correspondents that advantage was being taken of this exemption and that wheat brans adulterated with worthless foreign materials were being sold under the general name of mixed feeds and that one company had even the face to call such a mixture "purity" mixed feed. Because of this discovery the inspector was instructed to collect samples of brans, etc., paying particular attention to goods of suspicious appearance. As a result 24 samples were found of these low grade goods. The results were printed in bulletin 63 of this Station.

After consultation with the Secretary of the Board of Agriculture (who is by law the prosecuting officer of violations of the feeding stuffs law), it was decided to reverse the earlier decision and bulletin 63 contained the following statement:

"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."

The large dealers in the State said that they believed that the publicity which had been given to these fraudulent goods would result in their not being sold except under the provisions of the law. They also explained that the goods labelled mixed feed by some mills were identical with those called brans by others, that it would be difficult to get these mills to change their labelling and that the strict enforcement of the letter of the law would result in a discrimination against perfectly reliable goods carrying the name mixed feed. As a result it was decided to wait and see what the outcome would be and no attempt was made to see that the later ruling was complied with.

When the inspector made his rounds in December, 1900, he was instructed to draw samples of brans and mixed feeds. As a result 46 samples were collected and analyzed. These goods were surprisingly high in protein. The lowest of them was labelled "bran" and had the appearance of being unadulterated. The two low samples of mixed feed were also probably straight goods.

The value of the inspection is strikingly shown in that only 3 at all suspicious samples were found in December, 1900, when a year earlier 24 samples of low grade goods were obtained.

For the reasons above stated and because of the freedom of this class of goods at present from adulterations, the Station will continue to treat the straight products from the milling of wheat as not coming under the requirements of the law. Brans, mixed feeds and more especially middlings vary greatly in feeding value. Large users will always find it to their advantage to send samples of these goods to the Station for analysis. This analysis will be made free of charge and the results promptly returned.

# 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, 1901.

| Station number. | Manufacturer, place of business and brand. |
|---|---|
| | THE AMERICAN AGRICULTURAL CHEM. CO., NEW YORK, N. Y. |
| 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 |
| 2326 | Clark's Cove Bay State Fertilizer |
| 2327 | Clark's Cove Bay State Fertilizer, G. G |
| 2390 | Clark's Cove Defiance Complete Manure |
| 2565 | Clark's Cove Great Planet Manure |
| 2328 | Clark's Cove King Philip Alkaline Guano |
| 1219 | Clark's Cove Seeding Down Fertilizer |
| 1607 | Cleveland Fertilizer for All Crops |
| 2619 | Cleveland High Grade Complete Manure |
| 2329 | Cleveland Potato Phosphate |
| 2109 | Cleveland Seeding Down Fertilizer |
| 2330 | Cleveland Superphosphate |
| 2331 | Crocker's "Corn Phosphate" |
| 2332 | Crocker's Grass and Oats Fertilizer |
| 2333 | Crocker's New Rival Ammoniated Superphosphate |
| 2566 | Crocker's Potato, Hop and Tobacco |
| 2335 | Crocker's "Superior" Fertilizer |
| 2567 | Cumberland Guano |
| 2336 | Cumberland Potato Fertilizer |
| 1395 | Cumberland Seeding Down Manure |
| 2337 | Cumberland Superphosphate |
| 2377 | Darling's Blood, Bone and Potash |
| 1230 | Great Eastern "General Fertilizer" |
| 1231 | Great Eastern "Grass and Oats Fertilizer" |
| 2395 | Great Eastern "High Grade" "Special Potato Manure" |
| 2384 | Great Eastern "Northern Corn Special" |
| 2568 | Great Eastern "Potato Manure" |
| 2369 | Otis Potato Fertilizer |
| 2380 | Otis Seeding Down Fertilizer |
| 2368 | Otis Superphosphate |
| 2338 | Pacific Grass and Grain Fertilizer |
| 2569 | Pacific High Grade General Fertilizer |
| 2339 | Pacific Nobsque Guano |
| 2340 | Pacific Potato Special |
| 2341 | Soluble Pacific Guano |
| 2570 | Soluble Pacific Guano with 10% Potash |
| 2342 | Packer's Union "Animal Corn Fertilizer" |
| 2343 | Packer's Union "Economical Vegetable Guano" |
| 2571 | Packer's Union Gardeners Complete Manure |

## ANALYSES OF MANUFACTURERS' SAMPLES, 1901.

| Station number. | Nitrogen. | | | | Phosphoric Acid. | | | | | | | Potash. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total. | | | | | Available. | | Total. | | | |
| | Soluble in water. | Insoluble in water. | Found. | Guaranteed. | Soluble. | Reverted. | Insoluble. | Found. | Guaranteed. | Found. | Guaranteed. | Found. | Guaranteed. |
| % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| 2112 | 1.06 | 2.40 | 3.46 | 3.30 | 5.36 | 3.32 | 1.51 | 8.68 | 8.00 | 10.19 | 9.00 | 6.91 | 7.00 |
| 2321 | 0.66 | 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 | 0.11 | 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 | 0.40 | 0.64 | 1.04 | 1.00 | 5.41 | 3.15 | 1.38 | 8.56 | 7.00 | 9.94 | 8.00 | 1.49 | 1.08 |
| 2323 | 0.77 | 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 | 0.81 | 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 |
| 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 | 0.62 | 1.40 | 2.02 | 2.06 | 7.21 | 2.42 | 2.36 | 9.63 | 8.00 | 11.99 | 9.00 | 1.95 | 1.50 |
| 2390 | 0.40 | 0.68 | 1.08 | 0.82 | 5.24 | 2.74 | 1.48 | 7.98 | 7.00 | 9.46 | 9.00 | 1.59 | 1.00 |
| 2565 | 1.88 | 1.52 | 3.40 | 3.30 | 5.20 | 3.01 | 1.96 | 8.21 | 8.00 | 10.17 | 9.00 | 7.43 | 7.00 |
| 2328 | 0.43 | 0.68 | 1.11 | 1.03 | 5.71 | 2.67 | 1.47 | 8.38 | 8.00 | 9.85 | 9.00 | 2.12 | 2.00 |
| 1219 | ...... | ...... | 2.33 | 1.03 | 7.18 | 2.55 | 1.89 | 9.73 | 8.00 | 11.62 | 10.00 | 2.59 | 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 |
| 2619 | 1.68 | 1.78 | 3.46 | 3.30 | 6.09 | 2.51 | 2.82 | 8.60 | 8.00 | 11.42 | 9.00 | 7.62 | 7.00 |
| 2329 | 0.62 | 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 | 0.11 | 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 | 0.66 | 1.40 | 2.06 | 2.03 | 7.17 | 2.35 | 2.62 | 9.52 | 8.00 | 12.14 | 9.00 | 2.03 | 1.50 |
| 2331 | 0.26 | 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 | ...... | 0.18 | 0.18 | ...... | 7.54 | 4.28 | 1.79 | 11.82 | 11.00 | 13.61 | 12.00 | 2.03 | 2.00 |
| 2333 | 0.23 | 1.14 | 1.37 | 1.03 | 4.82 | 3.70 | 2.47 | 8.52 | 8.00 | 10.99 | 9.00 | 2.12 | 2.00 |
| 2566 | 1.10 | 1.10 | 2.20 | 2.06 | 5.98 | 2.07 | 2.68 | 8.05 | 8.00 | 10.73 | ...... | 3.34 | 3.00 |
| 2335 | 0.10 | 0.96 | 1.06 | 0.82 | 5.19 | 3.87 | 2.11 | 9.06 | 8.00 | 11.17 | 9.00 | 2.12 | 2.00 |
| 2567 | 0.03 | 1.23 | 1.26 | 1.03 | 6.22 | 3.00 | 2.49 | 9.22 | 8.00 | 11.71 | 10.00 | 2.28 | 2.00 |
| 2336 | 0.72 | 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 | 0.56 | 1.38 | 1.94 | 2.06 | 7.01 | 2.38 | 2.55 | 9.39 | 8.00 | 11.94 | 9.00 | 2.35 | 1.50 |
| 2377 | ...... | 4.21 | 4.21 | 4.12 | 6.47 | 1.27 | 0.26 | 7.74 | 7.00 | 8.00 | 8.00 | 9.01 | 7.00 |
| 1230 | ...... | ...... | 1.10 | 0.82 | 0.69 | 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 |
| 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 |
| 2384 | 0.42 | 1.84 | 2.26 | 2.06 | 5.02 | 4.60 | 2.35 | 9.62 | 8.00 | 11.98 | 8.00 | 2.26 | 1.50 |
| 2568 | 0.85 | 1.23 | 2.08 | 2.06 | 5.92 | 2.31 | 2.76 | 8.23 | 8.00 | 10.99 | 9.00 | 3.37 | 3.00 |
| 2369 | 0.77 | 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 | 0.49 | 0.62 | 1.11 | 1.25 | 5.46 | 2.89 | 1.35 | 8.35 | 8.00 | 9.70 | 10.00 | 1.56 | 2.00 |
| 2368 | 0.68 | 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 | 0.42 | 0.64 | 1.06 | 0.82 | 5.46 | 3.01 | 1.43 | 8.47 | 7.00 | 9.90 | 8.00 | 2.99 | 1.00 |
| 2569 | 2.13 | 1.41 | 3.54 | 3.30 | 5.15 | 2.92 | 2.14 | 8.07 | 8.00 | 10.21 | 9.00 | 7.18 | 7.00 |
| 2339 | 0.40 | 0.66 | 1.06 | 1.03 | 5.52 | 2.66 | 1.63 | 8.18 | 8.00 | 9.81 | 9.00 | 1.97 | 2.00 |
| 2340 | 0.76 | 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 | 0.52 | 1.46 | 1.98 | 2.06 | 6.72 | 2.72 | 2.32 | 9.44 | 8.00 | 11.76 | 9.00 | 1.91 | 1.50 |
| 2570 | 1.05 | 1.19 | 2.24 | 2.47 | 4.24 | 5.57 | 2.14 | 5.81 | 6.00 | 7.95 | 7.00 | 10.70 | 10.00 |
| 2342 | 0.31 | 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 | 0.26 | 1.42 | 1.68 | 1.25 | 4.65 | 2.55 | 2.15 | 7.20 | 6.00 | 9.35 | 7.00 | 3.59 | 3.00 |
| 2571 | 1.38 | 1.16 | 2.54 | 2.47 | 5.58 | 0.47 | 2.06 | 6.05 | 6.00 | 8.11 | ...... | 10.99 | 10.00 |

DESCRIPTIVE LIST OF MANUFACTURERS' SAMPLES, 1901.

| Station number. | Manufacturer, place of business and brand. |
|---|---|
| 2344 | Packer's Union "Potato Manure" |
| 2345 | Packer's Union "Universal Fertilizer" |
| 1619 | Packer's Union "Wheat, Oats and Clover Fertilizer" |
| 2393 | Quinnipiac Climax Phosphate for All Crops |
| 2347 | Quinnipiac Corn Manure |
| 2572 | Quinnipiac Market Garden Manure |
| 2573 | Quinnipiac Mohawk Fertilizer |
| 2348 | Quinnipiac Phosphate |
| 2349 | Quinnipiac Potato Manure |
| 2350 | Quinnipiac Potato Phosphate |
| 2351 | Quinnipiac Seeding Down Manure |
| 2352 | Read's Potato Manure |
| 1396 | Read's Practical Potato Special |
| 2353 | Read's Samson Fertilizer |
| 1397 | Read's Standard Fertilizer |
| 2354 | Read's Sure Catch Fertilizer |
| 2355 | Read's Vegetable and Vine Fertilizer |
| 1414 | Standard A. Brand |
| 2574 | Standard Bone and Potash |
| 2394 | Standard Complete Manure |
| 2361 | Standard Fertilizer |
| 2362 | Standard Guano |
| 2363 | Standard Special for Potatoes |
| 2364 | Williams and Clark's Americus Ammoniated Bone Superphosphate |
| 2365 | Williams and Clark's Americus Corn Phosphate |
| 2366 | Williams and Clark's Americus Potato Manure |
| 2575 | Williams and Clark's Americus with 10% Potash |
| 2576 | Williams and Clark's High Grade Special |
| 2367 | Williams and Clark's Potato Phosphate |
| 1236 | Williams and Clark's Royal Bone Phosphate for all Crops |
| | HIRAM BLANCHARD, EASTPORT, ME. |
| 2577 | Blanchard's Fish, Bone and Potash |
| 2578 | Blanchard's Ground Fish Scrap No. 2 |
| | THE BOWKER FERTILIZER CO., BOSTON, MASS. |
| 2579 | Bowker's Corn Phosphate |
| 2580 | Bowker's Early Potato Manure |
| 2581 | Bowker's Farm and Garden Phosphate |
| 2582 | Bowker's Hill and Drill Phosphate |
| 2583 | Bowker's Market Garden Fertilizer |
| 2584 | Bowker's Potash Bone |
| 2585 | Bowker's Potash or Staple Phosphate |
| 2586 | Bowker's Potato and Vegetable Fertilizer |
| 2587 | Bowker's Potato and Vegetable Phosphate |
| 2588 | Bowker's Six Per cent Potato Fertilizer |
| 2589 | Bowker's Square Brand Bone and Potash |
| 2590 | Bowker's Sure Crop Phosphate |

## ANALYSES OF MANUFACTURERS' SAMPLES, 1901.

| 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. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| 2344 | 0.96 | 1.10 | 2.06 | 2.06 | 4.85 | 3.16 | 1.85 | 8.01 | 8.00 | 9.86 | 9.00 | 6.54 | 6.00 |
| 2345 | 0.25 | 0.96 | 1.21 | 0.82 | 6.05 | 3.22 | 1.46 | 9.27 | 8.00 | 10.73 | 9.00 | 5.04 | 4.00 |
| 1619 | .... | .... | 0.25 | ...... | ..... | ..... | 1.20 | 10.92 | 11.00 | 12.12 | 12.00 | 2.39 | 2.00 |
| 2393 | 0.39 | 1.06 | 1.45 | 1.03 | 5.10 | 3.54 | 1.63 | 8.64 | 8.00 | 10.27 | 9.00 | 2.91 | 2.00 |
| 2347 | 0.67 | 1.38 | 2.05 | 2.06 | 6.69 | 2.63 | 2.41 | 9.32 | 8.00 | 11.73 | 9.00 | 1.95 | 1.50 |
| 2572 | 2.19 | 1.39 | 3.58 | 3.30 | 4.23 | 4.67 | 1.47 | 8.90 | 8.00 | 10.37 | 9.00 | 7.57 | 7.00 |
| 2573 | 0.03 | 0.83 | 0.86 | 0.82 | 2.60 | 4.87 | 3.86 | 7.47 | 7.00 | 11.33 | 8.00 | 1.58 | 1.00 |
| 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 | 0.74 | 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 | 0.39 | 0.64 | 1.03 | 1.03 | 5.44 | 3.14 | 1.46 | 8.85 | 8.00 | 10.04 | 9.00 | 2.61 | 2.00 |
| 2352 | 0.42 | 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 | 0.83 | 3.39 | 1.55 | 0.54 | 4.94 | 4.00 | 5.48 | 5.00 | 8.35 | 8.00 |
| 2353 | 0.52 | 1.40 | 1.92 | 2.05 | 6.40 | 2.35 | 1.89 | 8.75 | 8.00 | 10.64 | 9.00 | 2.93 | 3.00 |
| 1397 | ..... | ...... | 1.15 | 0.83 | 6.50 | 1.73 | 0.92 | 8.23 | 8.00 | 9.15 | 9.00 | 4.33 | 4.00 |
| 2354 | ...... | 0.20 | 0.20 | ... | 4.46 | 5.17 | 1.58 | 9.81 | 10.00 | 11.39 | 11.00 | 1.91 | 2.00 |
| 2355 | 0.32 | 1.80 | 2.12 | 2.05 | 5.94 | 2.25 | 1.38 | 8.29 | 8.00 | 9.67 | 9.00 | 6.35 | 6.00 |
| 1414 | .. . | ...... | 1.33 | 0.82 | 4.84 | 3.08 | 1.96 | 7.92 | 7.00 | 9.88 | 9.00 | 1.71 | 1.00 |
| 2574 | ...... | . ... | ...... | ...... | 7.66 | 2.60 | 1.96 | 10.26 | 10.00 | 12.22 | 11.00 | 2.08 | 2.00 |
| 2394 | 2.40 | 0.90 | 3.30 | 3.30 | 7.02 | 1.99 | 1.04 | 8.81 | 8.00 | 9.85 | 9.00 | 7.56 | 7.00 |
| 2361 | 0.60 | 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 | 0.37 | 0.70 | 1.07 | 1.03 | 5.31 | 3.03 | 1.44 | 8.34 | 8.00 | 9.78 | 9.00 | 2.10 | 2.00 |
| 2363 | 0.82 | 1.20 | 2.02 | 2.05 | 5.65 | 5.16 | 2.40 | 10.81 | 8.00 | 13.21 | 9.00 | 2.93 | 3.00 |
| 2364 | 0.95 | 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 | 0.56 | 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 | 0.64 | 1.32 | 1.96 | 2.06 | 5.52 | 4.89 | 2.23 | 10.41 | 8.00 | 12.64 | 9.00 | 3.03 | 3.00 |
| 2575 | 0.96 | 1.18 | 2.14 | 2.47 | 4.18 | 2.29 | 1.67 | 6.47 | 6.00 | 8.14 | 7.00 | 10.62 | 10.00 |
| 2576 | 2.15 | 1.39 | 3.54 | 3.30 | 3.80 | 4.10 | 2.15 | 7.90 | 8.00 | 10.05 | 9.00 | 7.48 | 7.00 |
| 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 |
| 1236 | ...... | ...... | 1.26 | 1.03 | 6.20 | 3.11 | 2.23 | 9.30 | 8.00 | 11.54 | 9.00 | 2.26 | 2.00 |
| 2577 | 1.27 | 2.13 | 3.40 | 4.00 | ..... | 2.84 | 2.74 | 2.84 | 2.56 | 5.58 | 4.28 | 3.48 | 2.82 |
| 2578 | 1.25 | 2.31 | 3.56 | 4.00 | ...... | 2.78 | 1.40 | 2.78 | 2.70 | 4.18 | 4.40 | 0.79 | 1.00 |
| 2579 | 0.40 | 1.14 | 1.54 | 1.50 | 2.27 | 5.90 | 2.19 | 8.17 | 8.00 | 10.36 | 10.00 | 2.52 | 2.00 |
| 2580 | 1.19 | 1.95 | 3.14 | 3.00 | 3.57 | 3.49 | 2.23 | 7.06 | 7.00 | 9.29 | 9.00 | 7.33 | 7.00 |
| 2581 | 0.52 | 1.16 | 1.68 | 1.50 | 2.30 | 6.62 | 2.50 | 8.92 | 9.00 | 11.42 | 11.00 | 2.80 | 2.00 |
| 2582 | 0.71 | 1.73 | 2.44 | 2.25 | 3.27 | 5.48 | 2.76 | 8.75 | 9.00 | 11.51 | 11.00 | 2.16 | 2.00 |
| 2583 | 0.63 | 1.73 | 2.36 | 2.25 | 3.73 | 3.01 | 0.53 | 6.74 | 6.00 | 7.27 | 7.00 | 10.46 | 10.00 |
| 2584 | 0.90 | ...... | 0.90 | 0.75 | 3.05 | 1.93 | 3.03 | 4.98 | 6.00 | 8.01 | 8.00 | 2.10 | 2.00 |
| 2585 | 0.18 | 0.74 | 0.92 | 0.75 | 1.69 | 6.43 | 2.15 | 8.12 | 8.00 | 10.27 | 10.00 | 3.37 | 3.00 |
| 2586 | 0.61 | 1.73 | 2.34 | 2.25 | 7.26 | 2.32 | 0.83 | 9.58 | 9.00 | 10.41 | 10.00 | 4.30 | 4.00 |
| 2587 | 0.30 | 1.18 | 1.48 | 1.50 | 2.28 | 6.79 | 2.31 | 9.07 | 9.00 | 11.38 | 11.00 | 2.32 | 2.00 |
| 2588 | 0.35 | 0.65 | 1.00 | 0.75 | 1.39 | 4.82 | 3.05 | 6.21 | 6.00 | 9.26 | 9.00 | 6.48 | 6.00 |
| 2589 | 1.03 | 0.81 | 1.84 | 1.50 | 1.04 | 3.68 | 7.10 | 4.72 | 6.00 | 11.82 | 12.00 | 2.34 | 2.00 |
| 2590 | ...... | 0.78 | 0.78 | 0.75 | 3.16 | 6.12 | 2.31 | 9.28 | 9.00 | 11.59 | 11.00 | 2.36 | 2.00 |

DESCRIPTIVE LIST OF MANUFACTURERS' SAMPLES, 1901.

| Station number. | Manufacturer, place of business and brand. |
|---|---|
| 2591 | Bowker's Ten Per Cent Manure |
| 2592 | Gloucester Fish and Potash |
| 2593 | Stockbridge Corn and Grain Manure |
| 2594 | Stockbridge Potato Manure |
| 2595 | Stockbridge Seeding Down Manure |
| | HENRY ELWELL & CO., NEW YORK, N. Y. |
| 2596 | Elwell's Eureka Fertilizer |
| 2597 | Elwell's Excelsior Potato Fertilizer |
| | LISTER'S AGRICULTURAL CHEMICAL WORKS, NEWARK, N. J. |
| 2614 | Lister's Animal Bone and Potash No. 2 |
| 2610 | Lister's High Grade Special for Spring Crops |
| 2613 | Lister's Seeding Down Fertilizer |
| 2609 | Lister's Special Corn and Potato Phosphate |
| 2611 | Lister's Success Phosphate |
| 2612 | Lister's U. S. Phosphate |
| | NEW ENGLAND FERTILIZER CO., BOSTON, MASS. |
| 2378 | New England Corn Phosphate |
| 2379 | New England Potato Fertilizer |
| | NATIONAL FERTILIZER CO., BRIDGEPORT, CONN. |
| 1886 | Chittenden's Complete Fertilizer |
| 2385 | Chittenden's Market Garden Fertilizer |
| | PARMENTER AND POLSEY FERTILIZER CO., PEABODY, MASS. |
| 2598 | A. A. Brand |
| 2599 | "P. & P." Grain Grower |
| 2346 | "P. & P." Potato Fertilizer |
| 2123 | Plymouth Rock Brand |
| 2124 | Special Potato Fertilizer |
| 2125 | Star Brand Superphosphate |
| | EDWIN J. PHILBRICK, AUGUSTA, ME. |
| 1888 | Philbrick's Fertilizer |
| | THE PORTLAND RENDERING CO., PORTLAND, ME. |
| 1616 | Portland Rendering Co.'s Bone Tankage |
| | PROVINCIAL CHEMICAL FERTILIZER CO., L'T'D, ST. JOHN, N. B. |
| 2560 | Provincial Chemical Fertilizer Co's Special Potato Phosphate |
| | THE RUSSIA CEMENT CO., GLOUCESTER, MASS. |
| 2616 | Maine State Grange Chemicals |
| 2617 | Maine State Grange Potato Manure |
| 2618 | Maine State Grange Seeding Down Fertilizer |
| 2600 | Essex A1 Superphosphate |
| 2601 | Essex Complete Manure for Corn, Grain and Grass |
| 1411 | Essex Complete Manure for Potatoes, Roots and Vegetables |
| 2106 | Essex Corn Fertilizer |
| 2602 | Essex Market Garden and Potato Manure |
| 2615 | Essex Special Potato Fertilizer for Aroostook County |
| 1568 | Essex XXX Fish and Potash |
| | SAGADAHOC FERTILIZER CO., BOWDOINHAM, MAINE. |
| 2603 | Aroostook Potato Manure |
| 2604 | Dirigo Fertilizer |
| 2605 | Sagadahoc Special Potato Fertilizer |
| 2606 | Sagadahoc Superphosphate |
| 2607 | Yankee Fertilizer |
| | JOHN WATSON, HOULTON, MAINE. |
| 2608 | Watson's Improved High Grade Potato Manure |

NOTE—As this bulletin was going to press the Lowell Fertilizer Company applied for licenses for the following brands to be offered in Maine in 1901: Swift's Lowell Bone Fertilizer, Swift's Lowell Animal Brand, Swift's Lowell Potato Manure, Swift's Lowell Potato Phosphate, Swift's Lowell Dissolved Bone and Potash. On application the results of the analyses of these brands will be sent to correspondents.

## ANALYSES OF MANUFACTURERS' SAMPLES, 1901.

| 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. | | |
| | % | % | % | % | % | % | % | % | % | % | % | % | % |
| 2591 | 0.17 | 0.69 | 0.86 | 0.75 | 1.29 | 3.92 | 1.99 | 5.21 | 5.00 | 7.20 | 7.00 | 10.34 | 10.00 |
| 2592 | 0.26 | 0.56 | 0.82 | 0.75 | 1.18 | 5.34 | 2.90 | 6.52 | 6.00 | 9.42 | 9.00 | 1.25 | 1.00 |
| 2593 | 1.29 | 1.97 | 3.26 | 3.00 | 3.51 | 1.59 | 2.04 | 8.10 | 8.00 | 10.14 | 10.00 | 7.24 | 7.00 |
| 2594 | 1.32 | 1.88 | 3.20 | 3.00 | 2.57 | 3.54 | 2.27 | 6.11 | 6.00 | 8.38 | 8.00 | 10.34 | 10.00 |
| 2595 | 0.79 | 1.59 | 2.38 | 2.25 | 2.97 | 2.88 | 4.24 | 5.85 | 6.00 | 10.09 | 10.00 | 10.04 | 10.00 |
| 2596 | 1.01 | 1.03 | 2.04 | 2.00 | 5.55 | 2.04 | 1.95 | 7.59 | 7.00 | 9.54 | 8.50 | 7.23 | 7.00 |
| 2597 | 1.41 | 1.57 | 2.98 | 2.85 | 4.64 | 1.27 | 2.19 | 5.91 | 5.50 | 8.10 | 7.00 | 10.63 | 10.00 |
| 2614 | ...... | ...... | ...... | ...... | 8.01 | 1.61 | 1.53 | 9.62 | 10.00 | 11.15 | 11.00 | 2.34 | 2.00 |
| 2610 | 0.59 | 1.07 | 1.66 | 1.65 | 6.36 | 1.54 | 2.23 | 7.90 | ..... | 10.13 | 8.00 | 10.75 | 10.00 |
| 2613 | 0.28 | 0.78 | 1.06 | 0.83 | 3.88 | 3.34 | 3.03 | 7.22 | 7.00 | 10.25 | 8.00 | 1.25 | 1.00 |
| 2609 | 0.59 | 1.07 | 1.66 | 1.65 | 5.44 | 3.22 | 2.54 | 8.66 | 8.00 | 11.20 | 9.00 | 3.23 | 3.00 |
| 2611 | 0.31 | 0.99 | 1.30 | 1.24 | 6.16 | 3.02 | 2.58 | 9.18 | 9.00 | 11.76 | 11.00 | 2.37 | 2.00 |
| 2612 | 0.22 | 1.30 | 1.52 | 1.03 | 6.38 | 2.56 | 2.86 | 8.94 | 8.00 | 11.80 | 9.00 | 2.38 | 2.00 |
| 2378 | 0.76 | 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 | 0.88 | 0.88 | 1.76 | 1.64 | 3.46 | 4.89 | .98 | 8.35 | 7.00 | 9.33 | 8.00 | 4.28 | 4.00 |
| 1886 | ...... | ...... | 3.79 | 3.30 | ..... | .... | 1.33 | 9.35 | 8.00 | 10.68 | 10.00 | 6.31 | 6.00 |
| 2385 | 1.22 | 1.00 | 1.22 | 2.47 | 4.45 | 2.60 | 2.48 | 7.05 | 6.00 | 9.53 | 8.00 | 5.94 | 5.00 |
| 2598 | 3.14 | 1.52 | 4.66 | 4.53 | 3.59 | 4.04 | 2.03 | 7.63 | 7.00 | 9.66 | 8.00 | 8.12 | 8.00 |
| 2599 | 0.59 | .61 | 1.20 | 0.82 | 3.30 | 4.45 | 4.32 | 7.75 | 7.00 | 12.07 | 8.00 | 2.70 | 2.00 |
| 2346 | 1.00 | 0.84 | 1.84 | 1.64 | 2.36 | 5.15 | 0.99 | 7.51 | 6.00 | 8.50 | 7.00 | 6.91 | 6.00 |
| 2123 | 0.21 | 2.08 | 2.29 | 2.47 | 3.81 | 4.21 | 1.38 | 8.02 | 8.00 | 9.40 | 9.00 | 4.19 | 4.00 |
| 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 |
| 2125 | 1.01 | 0.79 | 1.80 | 1.64 | 3.80 | 3.54 | 1.15 | 7.34 | 7.00 | 8.49 | 8.00 | 2.60 | 2.50 |
| 1888 | 0.38 | 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 | ...... | ...... |
| 2560 | ...... | ...... | 3.46 | 3.25 | 6.81 | 1.44 | 6.68 | 8.25 | 8.00 | 14.93 | 10.00 | 7.20 | 6.00 |
| ...... | ...... | ..... | ...... | ..... | .... | ...... | .... | ...... | ...... | ...... | ...... | ...... | ...... |
| 2617 | 0.63 | 0.95 | 1.58 | 1.50 | 5.33 | 4.61 | 1.82 | 9.94 | 9.00 | 11.76 | 12.00 | 10.89 | 12.00 |
| 2618 | 0.30 | 1.48 | 1.78 | 1.50 | 4.88 | 4.94 | 3.83 | 9.82 | 7.00 | 13.65 | 13.00 | 5.52 | 5.50 |
| 2600 | 0.18 | 1.34 | 1.52 | 1.00 | 1.96 | 5.33 | 4.93 | 7.29 | 7.00 | 12.22 | 9.00 | 2.11 | 2.00 |
| 2601 | 0.97 | 2.91 | 3.88 | 3.30 | 5.90 | 3.75 | 1.50 | 9.65 | 7.00 | 11.15 | 10.00 | 9.36 | 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 | 0.52 | 1.72 | 2.24 | 2.00 | 5.31 | 4.03 | 4.14 | 9.34 | 9.00 | 13.48 | 10.50 | 3.33 | 3.00 |
| 2602 | 0.79 | 1.55 | 2.34 | 2.00 | 5.25 | 5.17 | 2.65 | 10.42 | 8.00 | 13.07 | 10.00 | 5.06 | 5.00 |
| 2615 | 1.14 | 2.06 | 3.20 | 2.50 | 3.09 | 4.06 | 4.31 | 7.15 | 7.00 | 11.46 | 9.00 | 5.07 | 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 |
| 2603 | 0.91 | 0.47 | 1.38 | 1.25 | 6.00 | 1.84 | 1.23 | 7.84 | 5.00 | 9.07 | 6.00 | 2.70 | 2.50 |
| 2604 | 0.29 | 0.83 | 1.12 | 1.50 | 5.57 | 3.53 | 6.17 | 9.10 | 7.00 | 15.27 | 11.00 | 1.81 | 3.00 |
| 2605 | 1.20 | 0.78 | 1.98 | 2.50 | 4.29 | 2.32 | 0.80 | 6.61 | 6.00 | 7.41 | 8.00 | 8.34 | 7.00 |
| 2606 | 0.93 | 0.79 | 1.72 | 2.00 | 4.45 | 2.73 | 1.05 | 7.18 | 7.00 | 8.23 | 9.00 | 4.30 | 3.00 |
| 2607 | 1.03 | 0.95 | 1.98 | 0.50 | 0.67 | 4.48 | 1.50 | 5.15 | 3.00 | 6.65 | 5.00 | 1.16 | ..... |
| 2608 | 1.56 | 1.86 | 3.42 | 3.00 | 3.19 | 3.26 | 4.19 | 6.45 | 6.00 | 10.64 | 7.00 | 5.18 | 5.00 |

# HOW TO FIGHT POTATO ENEMIES.

CHAS. D. WOODS.

Because of the importance of the subject and numerous inquiries from correspondents, the following specific directions for combatting the more common insect and fungus enemies of the potato have been prepared. The directions are based not only upon our experiments, experience and observation, but upon those of other investigators and practical growers in this and other states.

By far the larger part of the enemies of the potato may readily be held in check by spraying with the more common insecticides and fungicides, and often, by a combination of materials, several enemies may be met with one application. The insect enemies can be met *after* they appear. The fungus diseases can be prevented and the successful fight must be made *before* they appear. In some seasons there is comparatively little loss from the attack of fungus diseases. In others the crop is a failure unless preventive measures are taken. No man can tell before hand whether the season will be favorable to the growth of the fungi or not. The moral is evident. Preventive measures must be taken with each crop.

## INSECT ENEMIES.

The flea beetle, which eats small round holes in the leaves, and the Colorado beetle ("potato bug"), which prefers the leaves, eats the stems and will eat the tuber if nothing else offers, readily succumb to poison. Their very greediness makes them the easier victims.

No adequate substitute for arsenical poisons has yet been found. Some things are distasteful and if abundantly applied will drive the beetles. Paris green is the most generally used. Lead Arsenate proved the most satisfactory with us.* To kill all the bugs the poison must be distributed over the entire plant. This is most readily and surely done by spraying. See formulas 3, 3a, 4 and 4a.

* For results of experiments with insecticides on potatoes see Bulletin 68 of this Station.

## FUNGUS DISEASES.*

While there are several fungus diseases which attack the potato, the scab and the early and late blight are the most prevalent and the ones most to be feared in Maine.

### POTATO SCAB.

Potato scab, which is too well known to need description, can be held in check by planting previously treated seed in clean land. As it is next to impossible to get this fungus out of the soil, great care should be taken not to get it in. Soak the uncut seed potatoes for two hours in either formula 1 or 1a and then spread out to dry. After drying the potatoes may be cut and planted in the usual way, care being taken not to allow them to touch any box, bag or bin where scabby potatoes have been kept. All treated tubers should be planted to avoid danger from the poison on them.

### EARLY BLIGHT.

This disease is wide spread and destructive. It is confined to the leaves and green stems, and appears about the time the tubers begin to form, but may come earlier if the growth of the plants has been checked in any way. The first indication of its presence is the appearance on the leaves of grayish brown spots, which soon become hard and brittle. The disease progresses rather slowly, the spots gradually becoming larger, especially along the edges of the leaflets. At the end of ten days to two weeks half of the leaf surface may be brown, withered, and brittle, while the rest is of yellowish green color. The tubers stop growing almost as soon as the leaves are attacked, and as a result the crop is practically worthless. This can be prevented by the use of Bordeaux mixture, formula 2.

### LATE BLIGHT, OR ROT.

This disease attacks the leaves, stems and tubers. Generally the first noticeable effect upon the leaves is the sudden appearance of brownish or blackish areas, which soon become soft and foul smelling. So sudden is the appearance of the disease in some cases, that fields which one day look green and healthy may within the next day or two become blackened as though swept

*For illustrated description of the fungus diseases of the potato send to your congressman, or the Secretary of Agriculture, Washington, D. C., or to this Station for Farmers' Bulletin No. 91 of the U. S. Department of Agriculture.

by fire. The rapid spread of the disease, which is caused by a parasitic fungus, is dependent in large measure upon certain conditions of moisture and heat. A daily mean temperature of from 72° to 74° F. for any considerable time, accompanied by moist weather, furnishes the best conditions for the spread of the parasite. On the other hand, if the daily temperature exceeds 77° for a few days, the development of the disease is checked. This fact explains why the fungus seldom occurs to any serious extent in sections where the mean daily temperature exceeds 77° for any length of time, and probably why it appears later than the so-called early blight. The late blight not only stops the growth of the tubers but causes them to rot. Bordeaux mixture (formula 2) will prevent this.

### LEAF DISEASES, ETC., RESEMBLING BLIGHT.

Leaf burn or scald sometimes occurs and may be confused with early blight. The tips and edges of the leaves turn brown and these discolored areas soon become hard and brittle. The burning or scalding may occur at any time and is the result of unfavorable conditions surrounding the plant. Long continued cloudy and damp weather followed by several hot and bright days is apt to result in the burning of the foliage. Leaf burn may also occur as the result of protracted dry weather.

Leaf poisoning or burning may occur where Paris green is applied to potatoes and frequently it can not be distinguished from early blight by any ordinary examination. It sometimes happens, therefore, that farmers are led to believe that their potatoes are affected with early blight and other diseases when the trouble has been brought on by themselves through the improper use of Paris green. Injuries resulting from the use of this substance are very apt to occur where flea beetles have eaten the foliage. The arsenic attacks the tissues at such points, and as a result more or less circular brown spots are produced, having for their centers the holes eaten out by the flea beetles. By combining the Paris green with Bordeaux mixture or with lime, these injuries may be avoided.

## HOW TO SPRAY.

Spraying is an effective method of applying insecticides and fungicides. To obtain the best results, the material must be applied forcibly in the form of a fine mist, *not* in coarse drops sprinkled over the foliage. Inasmuch as spraying is a preventive measure (not a cure) the whole surface of the plant must, so far as possible, be covered.

## THE APPARATUS.

The necessary apparatus consists of a force pump, hose, nozzles, a barrel for holding the spraying mixture and a wagon for carrying all.

*The Pump:* The pump should be large enough to easily supply 4 double nozzles and should have as an accessory a good agitator. The small bucket pumps and knapsack sprayers do very well for a few plants in the kitchen garden, but for field work they are unsatisfactory. All parts of the pump that are subject to wear should be made of brass and should be carefully adjusted. The pump and all other apparatus should be thoroughly washed every time after using.

*The Hose:* In case an automatic sprayer is not used, 2 pieces of 1-2 inch hose 10 to 20 feet long are needed.

*The Nozzle:* There are many good nozzles, but the best tried at the Experiment Station, are the Vermorel, sold by most dealers in spraying apparatus; the McGowen, made by John J. McGowen, Ithaca, N. Y., and the Bordeaux, made by the Deming Company, Salem, Ohio. The Vermorel throws a finer spray than the others, and is the best for potatoes, but is easily clogged unless the spraying mixture is carefully strained through cheesecloth or a fine wire screen before using. With automatic sprayers, double nozzles should be used.

*The Barrel:* A kerosene barrel, holding about fifty gallons, is a convenient tank. It can be placed upon the side or stood on end, but the first position is preferable. A small opening should be made in which to place the pump, and another, larger one, through which to fill the tank and stir the mixture.

*The Wagon:* Any low wagon, or even dump-cart will answer the purpose. For convenience in turning, a two wheeled cart is to be preferred.

*Automatic Sprayers:* In large fields automatic sprayers which will cover four rows at once may be used with satisfactory results. Such a machine consists essentiallv of a barrel, containing an agitator for keeping the liquid stirred, mounted upon a two wheeled cart, a force pump (which mav be a hand pump, but preferably one driven by a spocket chain in the rear) with nozzles which can be set to any width of row. To give the best results two nozzls should be used for each row. Combinations of two nozzles can be obtained from dealers.

## FORMULAS.

CAUTION: *The following formulas are for use on the potato. In many cases they are not adapted for more tender plants. Keep all poisons carefully labelled and out of the reach of children and animals.*

### Formula 1. CORROSIVE SUBLIMATE.

| | |
|---|---|
| Corrosive Sublimate | 2 ounces |
| Water | 15 gallons |

The corrosive sublimate dissolves readily in water.

### Formula 1a.

| | |
|---|---|
| Formaline (40% solution formaldehyde) | 8 fluid ounces |
| Water | 15 gallons |

### Formula 2. BORDEAUX MIXTURE.

| | |
|---|---|
| Copper Sulphate | 5 pounds |
| Fresh Lime (unslacked) | 5 pounds |
| Water | 50 gallons* |

The copper salt is dissolved and the lime slacked in separate vessels. Dissolve the copper sulphate ("Blue Stone") in about two gallons of hot water in a wooden or earthern vessel by stirring, or by suspending it from the top of the vessel in a cloth bag; pour the solution into the tank or barrel used for spraying and fill one-third to one-half full of water. Slack the lime by the addition of a small quantity of water, and when slacked add two or three gallons of water and stir freely. Pour the milk of lime thus made into the sulphate solution, passing it through a brass wire strainer of about 30 meshes to the inch (No. 50) or through a cheese-cloth backed by common window screen.

* An ordinary oil barrel holds about 50 gallons.

Stir constantly while adding the lime. Add water to make the amount desired.

Much time may be saved by preparing stock solutions. While any proportions can be used, the following was found in the spraying experiments made by the Station a convenient way:

The stock solution of copper sulphate is made by weighing out 50 pounds of copper sulphate, placing it in a bag and suspending it in the top of a barrel containing 30 gallons of water. The copper sulphate dissolves completely in a few hours. The stock solution of the lime is prepared by slacking 50 pounds of lime, and adding water so as to make up to 30 gallons and straining through No. 50 brass screen cloth. To slack and strain this amount of lime takes less than one-half hour. For use, 3 gallons of each solution and 44 gallons of water make up the formula given above. The stock solution of lime should be kept well covered and be thoroughly stirred before dipping out.

Formula 3. BORDEAUX MIXTURE AND PARIS GREEN.

Paris Green .................................... ½ pound
Bordeaux Mixture ............................... 50 gallons

Make a paste with the Paris green and a little water. Add to the Bordeaux mixture and stir thoroughly.

Formula 3a. BORDEAUX MIXTURE AND LEAD ARSENATE.

Lead Arsenate or Disparene........................ 1 pound
Water .......................................... 50 gallons

Formula 4. PARIS GREEN.

Paris Green .................................... ½ pound
Lime (unslacked) ............................... 3 pounds
Water .......................................... 50 gallons

The standard remedy for the destruction of insects which eat the foliage or fruit. The lime is added to prevent the Paris green from burning the foliage. Slack the lime in a little water, make into a thin paste and strain. Wet up the Paris green with a little water into a thin paste. Mix the lime and Paris green and add the remainder of the water. A stock solution of lime can be made as described under formula 2.

Formula 4a. LEAD ARSENATE.*

Lead Arsenate ................................1 pound
Water .......................................50 gallons

Arsenate of Lead acts slower as a poison than Paris green. It can be kept suspended in the water better than Paris green; it does not burn foliage and sticks to the foliage better than Paris green. For these reasons it proved, in our experiments in 1900, more satisfactory than Paris green.

### WHAT TO DO, AND WHEN AND HOW TO DO IT.

The treatment at various times during the season and the purpose of the same, briefly stated, are as follows:

A. Corrosive Sublimate (formula 1) or Formaline (formula 1a): before planting immerse the tubers for two hours, then dry and cut. For scab.

B. Bordeaux mixture and Paris green (formula 3) or Bordeaux mixture and lead arsenate (formula 3a): when the plants are three or four inches high, or as soon as the potato beetle appears. For potato beetle, flea beetle, and early blight.

C. Repeat B at intervals so as to keep new leaves protected.

D. Bordeaux mixture (formula 2) about August 1 to 15. For late blight and rot.

E. Repeat D after about two weeks.

Four sprayings are usually sufficient to protect from blight.

Begin while the tops are still small and spray again as soon as tops have made 6 or 8 inches of new growth and keep this up as long as the tops are growing rapidly.

Directions for spraying the apple and how to fight cucumber enemies will be sent on application.

CHAS. D. WOODS, *Director,*
Orono, Maine.

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* Swift's Lead Arsenate or Bowker's Disparene.

# THE MANURIAL VALUE OF ASHES, "MUCKS," SEA-WEEDS AND BONE.

CHAS. D. WOODS.

In his efforts to grow crops the intelligent farmer must ever try to conserve and add to the stock of available plant food in the soil. The fertility of a soil is measured by its power to produce crops. A soil may have many hundreds of pounds of plant food per acre, and still be unfertile, while another may contain little plant food, but may have that little in an available form and thus be productive, i. e., fertile.

Usually manures are applied to soils for the double purpose of supplying plant food in an available form and unlocking the unavailable compounds already in the soil. The direct manurial value of fertilizing materials of the *same class* can be accurately measured by chemical analysis. Sometimes as the results of field and pot experiments it is also possible to extend this comparison of analyses to materials of unlike nature. In general, however, it is not enough to know the pounds of nitrogen, phosphoric acid and potash in a given manure, but we must by actual experiment with the living plant find out how much of these materials is available to the plant. In studying the manurial value of the three classes of fertilizing materials discussed in this bulletin, these facts must be kept in mind. For example, in comparing a "muck" with 2½ pounds of nitrogen in 100 pounds of dry matter with stable manure with only 1¾ pounds of nitrogen in the same weight, a great mistake would be made in thinking the muck a better fertilizer than the manure. The nitrogen of the muck is largely unavailable as plant food until it has been treated by composting, exposure to the air, etc., while the stable manure contains in itself the ferments necessary to render its nitrogen available to the growing plant. In like manner the phosphoric acid of a superphosphate is in a form ready to be assimilated by the growing plant, while that of wood ashes may be practically insoluble and only slowly available to the plant.

If plant food is not in an immediately available form the material containing it may still possess manurial value. To utilize all kinds of plant food at one's disposal is an important item in farm economy. The classes of such materials more or less accessible to the farmers of Maine are ashes, "mucks" seaweeds and bones. Partly because of accumulated unpublished analyses of samples sent to the Station by correspondents and partly in answer to inquiries respecting the manurial value of these materials, this bulletin has been prepared.

## Wood Ashes.

Maine farmers are pretty well agreed as to the high value of wood ashes as a fertilizer. The fertilizing value of wood ashes is commonly attributed to the potash which they contain. While the potash has the largest money value of the fertilizing constituents of ashes, their agricultural value also depends upon the not inconsiderable amounts of phosphoric acid and the large amounts of lime which they carry. The importance of these last constituents is indicated by the high value some farmers put upon leached ashes as a manure, although in leaching nearly all of the water soluble potash has been removed. The potash content of ashes varies with the kind of wood, the method of burning, and the care taken of the ashes to protect them from rain.

The Ontario Agricultural College* has made quite a study of the composition of the ashes of different woods. And while these results, usually from single specimens, cannot be taken as final, they are suggestive and instructive. Some of the more important of these analyses are given in the table which follows.

*Report Ontario Agricultural College and Experimental Farms, 1896, pp.24-26.

POUNDS OF PHOSPHORIC ACID, POTASH AND LIME IN 100 POUNDS WATER-FREE ASH OF THE WOOD OF THE TREES INDICATED.

| Kind of wood. | Phosphoric acid. | Potash. | Lime. |
|---|---|---|---|
| Sugar Maple | 2.03 | 9.31 | 45.24 |
| Soft Maple | 1.29 | 9.52 | 41.97 |
| Black Ash | 1.20 | 25.30 | 49.04 |
| Oak | 1.69 | 9.39 | 43.54 |
| Birch | 1.47 | 8.58 | 37.10 |
| Elm | .45 | 35.37 | 23.64 |
| Beech | 1.39 | 7.58 | 41.21 |
| Apple | 1.81 | 4.84 | 44.93 |
| White-Ash | .93 | 16.88 | 37.14 |
| Basswood | 5.28 | 9.39 | 33.42 |
| Poplar | 2.98 | 10.42 | 28.38 |
| Hemlock | 2.76 | 8.73 | 45.83 |
| Pine | 4.03 | 11.22 | 20.28 |
| Cedar | .98 | 3.30 | 49.06 |
| Spruce | 4.00 | 8.98 | 25.8 |

As stated above, the results of the analysis of single specimens of wood can be taken as indications only. In two instances this Station has analyzed the ash of known woods with results differing from the above as follows:

PHOSPHORIC ACID AND POTASH IN 100 POUNDS ASH OF BIRCH AND CEDAR. THE RESULTS OF MAINE ANALYSES COMPARED WITH THOSE OF CANADA.

| | | Phosphoric acid. | Potash |
|---|---|---|---|
| Birch, | Maine analyses | 6.05 | 12.04 |
| | Canada analyses | 1.81 | 8.58 |
| Cedar, | Maine analyses | 1.91 | 5.09 |
| | Canada analyses | .98 | 3.30 |

With allowance for individual variations the results are striking and interesting. The popular idea of the low value of beech ashes is confirmed but the prevailing belief in the low value of soft wood ashes as compared with hard wood ashes does not seem to be well founded. The potash in maple, oak, birch

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and beech averages rather less than that of hemlock, pine and spruce. While this is true of the carefully prepared ashes, it does not seem to hold in the case of ashes actually made in burning. The following table shows the analyses of different samples of gathered ashes made by this Station:

POUNDS OF FERTILIZING CONSTITUENTS CONTAINED IN 100 POUNDS OF DIFFERENT SAMPLES OF WOOD ASHES ANALYZED AT THE MAINE STATION.

| Laboratory number. | Kind of ashes. | Water. | Phosphoric acid. | Potash. | | | Lime. |
|---|---|---|---|---|---|---|---|
| | | | | Soluble in water. | Insoluble in water. | Total. | |
| | UNLEACHED ASHES. | | | | | | |
| 71 | Hard wood | 4.40 | 3.00 | 7.12 | 1.34 | 8.46 | 38.60 |
| 74 | Mostly hard wood | .80 | 2.56 | 7.74 | 1.26 | 9.00 | 36.59 |
| 85 | Pure birch wood | .06 | 6.05 | 10.43 | 1.61 | 12.04 | 39.07 |
| 82 | Hard wood | 3.30 | 2.98 | 5.24 | 2.03 | 7.27 | 31.65 |
| 250 | Hard wood | ..... | 2.00 | 7.82 | ..... | ..... | ..... |
| 3003 | Hard wood, Canada | ..... | ..... | 9.63 | ..... | ..... | ..... |
| 3013 | Hard wood, Canada | ..... | ..... | 8.09 | ..... | ..... | ..... |
| | Hard wood, average | 2.40 | 3.32 | 8.01 | 1.56 | 9.57 | 36.48 |
| 70 | Soft wood, household fires | 4.64 | 1.78 | 2.64 | 2.01 | 4.65 | 23.62 |
| 834 | Cedar ashes | 1.52 | 1.91 | 5.09 | ..... | ..... | ..... |
| | Dump ashes: | | | | | | |
| 64 | Soft wood, mostly spruce | 20.63 | .64 | 2.38 | .64 | 3.02 | 29.36 |
| 66 | Soft wood, mostly spruce | 3.84 | 1.50 | 1.35 | 1.27 | 2.62 | 31.22 |
| 67 | Soft wood, mostly pine | ..... | .66 | .40 | 1.13 | 1.53 | 37.72 |
| 86 | Mill waste, mostly spruce | ..... | 1.58 | 1.90 | 1.16 | 3.06 | 38.72 |
| | Soft wood, dump, average | ..... | 1.09 | 1.51 | 1.05 | 2.56 | 34.25 |
| | Mill furnace ashes: | | | | | | |
| 65 | From spruce sawdust | 1.19 | 1.40 | 3.43 | .96 | 4.39 | 35.90 |
| 68 | Soft wood, mostly spruce | ..... | 1.27 | .88 | 1.05 | 1.93 | 46.14 |
| 69 | Soft wood, mostly spruce | 88 | 1.47 | 3.50 | 1.70 | 5.20 | 46.20 |
| 587 | Soft wood, mostly spruce | ..... | 2.70 | 4.69 | ..... | ..... | ..... |
| 3004 | Soft wood, mostly spruce | ..... | ..... | 2.56 | ..... | ..... | ..... |
| 3014 | Soft wood, mostly spruce | ..... | ..... | 5.70 | ..... | ..... | ..... |
| | Soft wood, furnace, average | ..... | 1.66 | 3.46 | 1.24 | 4.70 | 42.75 |
| | Canada ashes—car lots: | | | | | | |
| 3024 | ..... | ..... | ..... | 3.27 | ..... | ..... | ..... |
| 3025 | ..... | ..... | ..... | 5.68 | ..... | ..... | ..... |
| 3026 | ..... | ..... | ..... | 6.64 | ..... | ..... | ..... |
| 3042 | ..... | ..... | ..... | 4.54 | ..... | ..... | ..... |
| 3043 | ..... | ..... | ..... | 3.85 | ..... | ..... | ..... |
| 3084 | ..... | ..... | ..... | 5.71 | ..... | ..... | ..... |
| | Canada ashes, average | ..... | ..... | 4.95 | ..... | ..... | ..... |
| 76 | Spent tan bark ashes | 1.05 | 1.44 | .98 | 1.12 | 2.10 | ..... |
| 843 | "Muck" ashes | ..... | Trace | ..... | ..... | Trace | ..... |
| | LEACHED ASHES. | | | | | | |
| 72 | Hard wood | 32.95 | 1.91 | .46 | .97 | 1.43 | 25.48 |
| 75 | Mostly hard wood, mixed | 31.25 | 1.54 | .35 | .93 | 1.28 | 20.00 |
| 77 | Mostly hard wood, probably | 31.22 | 1.52 | .90 | .56 | 1.46 | 32.97 |
| 80 | Mostly hard wood | 31.40 | 1.96 | 1.13 | .72 | 1.85 | 29.06 |
| 73 | Soft and hard wood, mixed | 34.05 | 1.42 | .29 | 1.32 | 1.61 | 20.54 |
| 81 | Mostly hard wood, Canada | 25.43 | 1.60 | .94 | .59 | 1.53 | 31.12 |
| | Leached ashes, average | 31.05 | 1.66 | .68 | .85 | 1.53 | 26.53 |

For the purpose of clearness the averages of the preceding table are given in a concise form in the table which follows:

POUNDS OF WATER, PHOSPHORIC ACID, WATER SOLUBLE POTASH AND LIME IN 100 POUNDS OF DIFFERENT CLASSES OF WOOD ASHES.

| Kinds of ashes. | Water. | Phosphoric acid. | Potash soluble in water. | Lime. |
|---|---|---|---|---|
| Unleached hard wood | .... .... | 3.3 | 8.0 | 36.5 |
| Unleached soft wood, household | ...... ... | 1.8 | 2.6 | 23.6 |
| Unleached soft wood, dump | ......... | 1.1 | 1.5 | 34.3 |
| Unleached soft wood, mill furnace | ...... .. | 1.7 | 3.5 | 42.8 |
| Unleached Canada, car lots | .......... | ... . .... | 5.0 | .......... |
| Leached mixed wood | 31.0 | 1.7 | .7 | 26.5 |

The results of the analyses indicate very clearly that different samples of ashes differ markedly in their manurial value. The unleached hard wood ashes are of much greater value than those of soft wood. As seen from the table on p. 67 this cannot be attributed chiefly to the kind of wood, but more to the method of burning and subsequent care. Potash is volatile at a not very high temperature and in case of very hot fires much of the potash would be driven off and lost. Dump and furnace ashes are more or less exposed to the weather. The rains if copious enough to wet through the pile would leach the ashes and carry off more or less of the water soluble potash. In case of a dry pile partially wet, the water falling upon the top will dissolve out the potash in the upper layers and carry it to the lower part of the pile. In the case of damp ashes drying out, the movement of water is toward the top and the water containing the potash would be drawn to the top and evaporate, leaving at the top of the pile the potash in the form of a more or less crystalline crust. With the next rain this would be dissolved and carried down into the pile to again reappear at the surface in subsequent evaporation of the moisture. It therefore follows that the composition of a pile of wet ashes is not uniform and that portions of it would be poorer than other parts in plant food. In selecting samples for analysis great care needs to be taken in order to be sure the sample fairly represents the whole.

The potash insoluble in water is chiefly the silicate of potash which is only slowly if at all available to plants. The phosphoric acid is all in insoluble form and how readily available is not known.

In addition to their manurial value, ashes have a decided effect upon the capillary power of the soils. If a solution of carbonate of potash, such as potash of wood ashes, is poured upon loam, it will be made muddier and stickier than it would be if moistened with water. Milton Whitney of the United States Department of Agriculture has investigated this subject and finds that alkaline solutions seem to loosen the particles of the clayey soil from the particles of sand and float off the clay particles, so as to fill up the spaces between the sand grains. As a result of this clogging of the pores, the circulation of the water is much retarded. That this action of an alkali is sometimes of great practical importance is attested by the fact observed by Whitney, that soils are met with in which the particles of clay are held so closely to the grains of sand that the soil has the appearance and properties of a sandy soil, although it may actually contain as much clay as many so-called clay soils. Carbonate of potash has a tendency to keep clay in a "puddled" condition. A ball or lump of moist clay, held together with alkaline carbonate does not tend to crumble during the process of drying, but remains a hard lump. As unleached ashes carry large amounts of potash lye, the application of ashes may have practically the same effect upon soils as the addition of carbonate of potash.

Potash soils also have a decided action upon soil nitrogen. These alkaline solutions have great power to dissolve organic matters and render unavailable nitrogen available. This tendency of potash to promote rank growth is well illustrated wherever the land has been recently cleared of wood and the logs burned. The rankness of growth which follows is probably due not only to the available potash thus returned to the soil, but also to the superabundant supply of nitrogenous food made available by the action of the alkali upon the soil humus and to the fact that alkali has a tendency to retain moisture.

A favorite way of applying wood ashes is as a top dressing to mowing or pasture lands. This encourages the growth of clover and some of the better grasses, with a tendency to crowd out inferior kinds of grasses, weeds and moss.

The presence of an alkali seems to favor the growth of potato scab. On land free from scab fungus, ashes are beneficial for potatoes. Leached ashes depend chiefly upon the phosphoric acid and lime for their value. Coal ashes have no fertilizing value and any effect they may have depends upon their mechanical condition.

A bushel of average unleached hard wood ashes weighs about 48 pounds. This would contain

| | | | | | |
|---|---|---|---|---|---|
| Potash | about | 4 | pounds, | worth | 20 cents |
| Phosphoric acid | " | 1½ | " | " | 3 " |
| Lime | " | 18 | " | " | 7 " |

Wet ashes are not much more compact than dry. A bushel of wet ashes weighs considerably more than a bushel of dry ashes, but this difference is chiefly due to the water. A bushel of wet or leached ashes contains about 50 pounds of dry matter or practically the same as a bushel of dry ashes.

Canada ashes as sold in car lots in this State carry from 3 to 7 per cent of potash, and would at the valuation thus used be worth from 18 cents to 28 cents a bushel. Average dump ashes at the same valuation will be worth about 13 cents, and average mill furnace ashes about 15 cents a bushel. In buying, the cost of carting and applying needs to be taken into account.

## "MUCK."

The correct use of the word muck, which means dung in a moist state, has been entirely lost in New England and is applied without much discrimination to any bog earth derived chiefly from decaying vegetable matter. The term as used includes materials ranging from a bog meadow mud to quite perfect peats. Large deep bogs containing true peat are comparatively few in New England, but small, shallow depressions, containing impure peats, occur everywhere. The gravelly soils of New

England need the addition of large amounts of organic matter and these impure peats have been thus used for generations under the general name of "muck." While the use of the word in this sense is provincial and perhaps not to be encouraged, it will be so used here for lack of a better term. By "peat" is generally understood a somewhat similar product in which the decomposition has not advanced so far. Such material is usually brownish in color and when dry has considerable fuel value.

These peaty soils or mucks are the results of the partial decay of vegetable materials. They are found in swampy places filled with stagnant water. The successive growth of sphagnum and other water-loving mosses, as well as the forest leaves falling into the water, are changed by decay into the black earths and impure peats. Mucks thus formed contain appreciable amounts of insoluble nitrogen and usually but little mineral matters, unless sand, clay or silt has been washed into them during their formation. Mucks owe their peculiar properties to this decomposed vegetable matter, which constitutes the *humus* of the agricultural chemist.

### ANALYSIS OF MUCKS.

During the past few years the Station has examined for correspondents a number of samples of these materials from different parts of the State.

The following table shows the pounds of water contained in mucks as they are taken from the bogs, and the varying weights of ash, organic matter, nitrogen, phosphoric acid and potash contained in 100 pounds of the *water-free* (perfectly dry) mucks:

POUNDS OF WATER IN 100 POUNDS FRESH MUCKS AS TAKEN FROM THE BEDS AND THE POUNDS OF ASH, ORGANIC MATTER, NITROGEN PHOSPHORIC ACID, AND POTASH IN 100 POUNDS OF PERFECTLY DRIED MUCKS.

| Laboratory number. | Locality. | Water in fresh mucks. | In water-free material. Organic matter. | In water-free material. Nitrogen. | Phosphoric acid. | Potash. |
|---|---|---|---|---|---|---|
| 278 | South Sebec | 83.2 | 86.9 | 2.77 | .17 | .02 |
| 279 | Turner | 75.1 | 78.9 | 1.29 | 1.15 | .07 |
| 280 | Brunswick | ...... | 96.2 | 1.98 | .27 | .17 |
| 281 | New Gloucester | ...... | 57.9 | 1.15 | .26 | .04 |
| 282 | Freedom | ...... | 65.4 | 1.51 | 1.97 | .27 |
| 835 | St. Albans | 77.5 | 80.9 | 1.70 | 1.08 | .14 |
| 841 | Burkettville | 80.7 | 92.3 | 2.16 | .54 | .08 |
| 842 | Burkettville | 79.5 | 65.6 | 1.67 | .96 | .20 |
| 218 | Thomaston | ...... | 57.2 | 2.06 | .46 | ...... |
| 219 | Wayne | ...... | 84.0 | 1.63 | .13 | ...... |
| 220 | East Eddington | ...... | 94.5 | 1.56 | .11 | ...... |
| 243 | Charlotte | 78.5 | 51.6 | 1.78 | .28 | .47 |
| 298 | North Leeds | 85.3 | ...... | 1.75 | ...... | ...... |
| 3001 | ...... | ...... | ...... | .68 | .02 | .06 |
| 3002 | Readfield | 86.8 | ...... | 1.86 | ...... | ...... |
| 3065 | Auburn | ...... | ...... | 1.78 | ...... | ...... |
| 3105 | Richmond Corner | 86.5 | ...... | 2.85 | trace | trace |
| 3106 | Burnham | ...... | ...... | 1.36 | .22 | .59 |
| 3107 | Burnham | ...... | ...... | 2.53 | .34 | .20 |
| 3165 | Jackson | ...... | ...... | 1.46 | .44 | .23 |
| 3166 | Grange | ...... | ...... | 1.19 | ...... | .20 |
| 3167 | Bar Harbor | 80.7 | ...... | 1.26 | trace | .90 |

POUNDS OF ASH, ORGANIC MATTER, NITROGEN, PHOSPHORIC ACID, AND POTASH IN 100 POUNDS OF DRY MATTER OF SUBSTANCES SOMEWHAT RESEMBLING MUCK IN APPEARANCE.

| Laboratory number. | Kind of Material. | Ash. | Organic matter. | Nitrogen. | Phosphoric acid. | Potash. |
|---|---|---|---|---|---|---|
| 221 | Sea shore "muck" | 22.7 | 77.3 | .69 | .16 | .02 |
| 222 | Decomposed sphagnum | ........ | ........ | .87 | ........ | .12 |
| 241 | Mussel mud | ........ | ........ | .32 | .16 | 1.06 |
| 3167 | Mussel mud | ........ | ........ | .46 | .59 | 1.43 |
| 593 | True peat | 18.1 | 81.9 | .34 | ........ | ........ |
| 244 | Drift on lake shore | ........ | ........ | 2.07 | .25 | .19 |
| 395 | Soil from dyked marsh | ........ | ........ | 2.45 | .24 | .28 |

## WATER IN MUCKS.

The large amount of water contained in this class of materials makes their handling laborious and expensive. When first shoveled out of the bed, more than three-fourths of the weight is due to the water. In the table it will be noted that the least water in 100 pounds of muck as taken from the bed was 75.1 pounds and in several cases there were more than 85 pounds of water in 100 pounds of the freshly shoveled muck.

It is never the case that mucks can be made perfectly dry in field or barn treatment. They are very retentive of moisture and even when shoveled out of the pit and allowed to remain in a heap until the dry season of the year, they still usually contain 40 to 50 per cent or more of water. If these materials are to be used as an absorbent in the stable, it is important that they be as thoroughly dried as practicable and kept protected from rains. One hundred pounds of well dried peaty muck will absorb 4 to 6 times its weight of urine.

## ASH OR MINERAL MATTERS IN MUCKS.

The quantity of ash in these impure peats examined by the Station is variable but is usually large. In one instance only 5 per cent of the dry matter was ash, while in another sample 48 pounds out of 100 pounds of dry muck was ash. This ash is chiefly sand and has very little fertilizing value. On this account, therefore, the greater the amount of ash generally the poorer the muck. The quite complete analysis of the ash of five samples of muck follows. The laboratory numbers of the samples are the same as in the table on page 73.

POUNDS OF MINERAL MATTER IN 100 POUNDS WATER FREE MUCK.

| | Sample number 278. | Sample number 279. | Sample number 280. | Sample number 281. | Sample number 282. |
|---|---|---|---|---|---|
| Sand, silica, etc. | .37 | 17.17 | 2.20 | 35.53 | 23.74 |
| Iron oxide and alumina | .35 | ......... | .30 | 3.53 | 2.54 |
| Lime | 6.55 | .72 | .25 | 1.88 | 3.67 |
| Magnesia, | 31 | ......... | .15 | .15 | 12 |
| Potash | .02 | .07 | .17 | .04 | .27 |
| Soda | .30 | ....... | .17 | .14 | .03 |
| Sulphuric acid | .70 | .17 | .10 | .34 | .82 |
| Phosphoric acid | .17 | 1.15 | .27 | .26 | 1.97 |
| Carbonic acid, coal, etc | 4.29 | ......... | .20 | .20 | 1.45 |
| Total ash | 13.06 | | 3.81 | 42.07 | 34.61 |

In the samples marked 278 and 280, the mineral matter probably consists for the most part of true ash—i. e., matter that once formed a part of the growing moss or other plants; although the large amount of lime in 278 may have come from the shells of minute organisms often found in shallow water. The large excess of mineral matter in the other samples must have proceeded from sand washed in from higher ground and is naturally poor in plant food.

### ORGANIC MATTER AND NITROGEN IN MUCK.

From the above table and that on page 73 it is evident that whatever value mucks have as fertilizers is not due to the minute amounts of phosphoric acid and potash which they carry but to the organic matter and its accompanying nitrogen.

Mucks vary greatly in the organic matter which they contain. Occasionally a peaty muck will have as high as 95 pounds of organic matter for each 100 pounds of dry matter, while others will have little more than half that amount. Since the value of the muck as an absorbent depends upon its organic matter, it follows that for litter a peaty muck is better than one that is clayey or sandy.

The nitrogen in mucks is for the most part in inert compounds and is not immediately available for plant food. The quantity of nitrogen in mucks also varies greatly. With one exception the mucks examined at the Station carried more than 1 pound of nitrogen for each 100 pounds of water-free muck. Ten samples had about 2 pounds in 100 and 3 samples had more than 2½ pounds of nitrogen for each 100 pounds of dry matter. It is not a matter of indifference whether the muck is high or low in nitrogen content. While by far the larger part of the nitrogen in these materials is in a form that is insoluble in water and is, considered as a plant food, comparatively inert, it is a matter of common experience that this nitrogen may be made to contribute to the support of crops, and that it has therefore a considerable money value.

When muck is exposed to the action of the air, as when mixed with ordinary cultivated soil, its nitrogen slowly undergoes change and is gradually rendered available to the growing plant. Through the action of bacteria proper to soils the nitrogenous constituents in the humus are changed to ammonia. The most favorable conditions for this bacterial action are moisture, air and warmth and the absence of acidity. Hence the process of conversion of unavailable nitrogen compounds to available forms may be hastened by the addition of lime or ashes to a muck and by composting. The use of muck as a stable absorbent adds greatly to its store of nitrogen because of the nitrogen of the urine thus taken up, and the germs always present in manures accelerate the conversion of the inert nitrogen into available forms.

In the preparation of muck for manure as well as in consideration of preserving farm yard manure the question of composting naturally presents itself. While the ability to procure commercial fertilizers readily has caused composts to fall somewhat into disrepute,—and while in certain localities, near cities, it may be more profitable to expend labor in hauling stable manure than in building compost heaps—it is true of a State of small proprietors, for whose labor there is at times no profitable outgo, that "the composting of muck and peat with stable and barnyard manures is surely destined to become one of the most important items in farm management."

Some mucks ferment of themselves when thrown into heaps and such kinds serve well as manures without weathering, fermentation or any kind of preparation. But the kinds most common in Maine are well nigh useless as manures unless they have been rotted or fermented. In view of these differences it is not strange that farmers frequently deem mere exposure of muck to the air to be a sufficient preparation of this material. While this is the case with some mucks, the safest and surest way of obtaining good results with muck is to ferment artificially in the compost heap.

Experience teaches that in many situations, a large proportion of the useful ingredients of dung and urine can be saved by composting with muck. It is equally certain through such composting the unavailable plant food of the muck is made available. The ferments are present in such amounts in farm manures that left to themselves they suffer by the fermentation, and most mucks are so deficient in ferments that by themselves the fermentation necessary to render their inert organic matter available will not take place.

In the preparation of muck composts, dung or fish are the materials commonly used to excite fermentation. Most farmers prefer to make compost in heaps. A common plan is to lay down a bed of muck six or eight feet wide and a foot or so thick and cover it with a layer of dung of somewhat less thickness, followed by another layer of muck and so on. Different farmers use very different proportions of muck. The ordinary practice seems to vary from 1 to 5 parts of muck to 1 part of dung. Rich dung from stall-fed cattle will ferment more muck than that from animals less highly fed. The practical rule is to use no more muck than can be thoroughly fermented by the manure. In the case of sour muck the addition of small amounts of lime or wood ashes will correct the acidity and hasten fermentation.

Nitrogenous manures cost more than others for the simple reason that concentrated nitrogenous compounds capable of supplying this element to plants are neither abundant nor readily prepared. "New sources of phosphate of lime have continually been discovered, so that the price of this article has not risen from year to year, in spite of the greatly extended use of it. But the assimilable nitrogen compounds are more costly than either phosphates or potash salts, and there is no immediate probability that their price will be much reduced. Hence the importance of recognizing clearly the value of the peat (muck) and the humus which are found already in the fields." *

## SEAWEEDS.

Seaweeds have long been used as manures in this country and in England. Here in New England there is abundant evidence of the great value of sea manure. According to Storer, with the exception of the intervale farms of the Connecticut river, the farms that depend upon manures derived from great cities, and a few localities in which the fertility is based upon fish manure, "the only really fertile tracts in New England are to be found back of the sea beaches upon which an abundant supply of seaweeds is thrown up by storms."

Under the name of seaweed are included a large number of plants which grow in the water on the coast and are found collected on the shelving beaches or in inlets, or adhering to the rocks covered by tide water. From their habit of growth, those which grow upon the rocks between low and high water mark are called rockweed. Others which grow in deeper water from low water mark out to a depth of four or five fathoms and are washed in by the tides are called driftweed or kelp. These materials are valuable agricultural resources to farmers located near tide water, but it is doubtful if the farmers along the coast of Maine fully appreciate their value and utilize them to the extent they should. They are used extensively on the coast of France, Germany, Great Britain, Ireland and southern New England and many fine farms owe their fertility almost wholly to these materials.

*Storer, Agriculture, Vol. II, p. 82.

SEAWEED AS CATTLE FOOD.

While their chief value is as a manure, some varieties of seaweeds are used as food and on some islands near the coast, sheep subsist largely upon them during the winter months.

Mr. H. A. Long of Roque Bluff has for many years been a successful grower of sheep on one of the islands of the Maine coast. During the present winter, agents for the Maine State Society for the Protection of Animals investigated the conditions under which the island sheep are kept. Three years ago Mr. Long sent samples of the kinds of rock weeds eaten by the sheep to the Station for analysis. Because of this and the investigation of the society above named, he recently wrote as follows:

"Are the elements found in the seaweed capable of sustaining life without any other food? We know that our sheep eat it in the winter and practically live on it for six or seven months in the year, and if it will keep them fat and strong, why is it that we must house our sheep and feed them hay and grain as we are told the law requires us to do? My cows will go to the shore nearly every day and eat some of the rockweed from the rocks, and I have never seen any hurt to them, or odor in milk. If possible I wish to have made plain to me the value of a pound of seaweed or rockweed, compared with a pound of good hay fed to a sheep or cow."

As the same question is of importance and interest to many in the state, the chief points given in the answer to Mr. Long are here presented:

The sample sent to the Station by Mr. Long was a mixture of several species of rockweed. They were separated into two lots and analyzed as two samples. The sample called rockweed consisted chiefly of two species of flat-stemmed rockweed, *Fucus vesiculosis* and *Fucus evanescens*. The other sample was sea lettuce. In the following table there is given the analyses of these samples, and for the purpose of comparison, there is also given the average analysis of a few common cattle and sheep fodders.

POUNDS OF WATER AND NUTRIENTS IN 100 POUNDS OF SEA WEEDS AS COLLECTED COMPARED WITH THE WATER AND NUTRIENTS IN 100 POUNDS OF COMMON CATTLE FODDERS.

| | Water. | Protein. | Fat. | Fiber. | Nitrogen-free extract. | Ash. |
|---|---|---|---|---|---|---|
| Rockweed (Fucus) .... .... | 73.9 | 2.8 | .4 | 3.5 | 13.1 | 6.3 |
| Sea lettuce (ulva)........... | 78.6 | 2.7 | .2 | 2.2 | 5.7 | 10.6 |
| Corn fodder (green)......... | 79.3 | 1.8 | .5 | 5.0 | 12.2 | 1.2 |
| Corn silage. ................ | 79.1 | 1.7 | .8 | 6.0 | 11.1 | 1.4 |
| Timothy grass. ............ | 61.6 | 3.1 | 1.2 | 20.2 | 11.8 | 2.1 |
| Timothy hay................ | 13.2 | 5.9 | 2.5 | 29.0 | 45.0 | 4.4 |
| Rye fodder (green).......... | 76.6 | 2.6 | .6 | 11.6 | 6.8 | 1.8 |
| Red clover (green).......... | 70.8 | 4.4 | 1.1 | 8.1 | 13.5 | 2.1 |

It will be seen from the table that in composition these seaweeds compare very well as a food with either corn fodder, corn silage, or rye fodder. While there have been no experiments upon the digestibility of these materials, because of the small amount of woody matter (fiber) in the seaweeds, it is fair to assume that they would be more readily and completely digested than the ordinary cereal green fodders.

### SEAWEED AS MANURE.

The Station has analyzed the two specimens above described with reference to the manurial value with the following results:

POUNDS OF WATER, ASH, NITROGEN, PHOSPHORIC ACID, AND POTASH IN 100 POUNDS OF SEAWEED.

| | Water. | Ash. | Nitrogen. | Phosphoric acid. | Potash. |
|---|---|---|---|---|---|
| Rockweed (*Fucus*)....... | 73.9 | 6.3 | .44 | .12 | .40 |
| Sea Lettuce (*Ulva*)....... | 78.6 | 10.6 | .43 | .10 | .40 |

The Rhode Island Experiment Station made quite a thorough study of the seaweeds of that state, and published the results in bulletin 21 of that Station, which is by far the best treatise on seaweeds and their use yet issued. The figures in the following table are derived from that bulletin. For the sake of comparison the results of the analysis are all calculated to a water content of 80 per cent.

POUNDS OF NITROGEN, PHOSPHORIC ACID AND POTASH CONTAINED IN 100 POUNDS OF DIFFERENT SEA WEEDS CONTAINING 80 PER CENT WATER AND COLLECTED AT DIFFERENT SEASONS OF THE YEAR.

| Kind of sea weed. | Time of year. | Nitrogen. | Phosphoric acid. | Potash. | Lime. |
|---|---|---|---|---|---|
| Ribbon weed, kelp or tangle...... | Winter | .38 | .09 | .57 | .31 |
| | Summer | .19 | .07 | .16 | .65 |
| Broad ribbon weed, broad leafed kelp, Devil's apron .............. | Winter | .45 | .12 | .78 | .57 |
| | Summer | .27 | .05 | .13 | .52 |
| Round stalked rock weed......... | Winter | .27 | .07 | .57 | .41 |
| | Summer | .13 | .06 | .55 | .45 |
| Flat stalked rock weed............ | Winter | .40 | .11 | .48 | .37 |
| | Summer | .16 | .08 | .62 | .37 |
| Eel grass, grass wrack............. | January | .34 | .03 | .13 | .64 |
| | March | .56 | .09 | .46 | .49 |
| | Sept. | .22 | .08 | .42 | .48 |

Both species of ribbon weed or kelp are common on the rocks of our coast at and below low water mark, and the round and flat-stalked rockweeds constitute at least three-fourths of the covering of the rocks and stones between tide marks. As seen from the table the plants gathered in the winter season are richer in fertilizer elements that those gathered in the summer. It would, therefore, seem advisable to collect seaweeds during the winter months and if not convenient to apply them at once to the fields, they could be stored in large heaps until spring.

On account of the large water content and consequent weight of seaweeds, transportation far inland is not profitable. A part of the water can be removed by spreading out thinly on the shore and allowing exposure to a hot sun for a few days, but it is a question whether this practice is economical on account of the increased labor involved, and if the material is leached by rains after it has become partially dried a part of the fertilizing element is lost.

In addition to the seaweeds proper which belong to the group of marine algae, the table includes the results of analyses of eel grass. Eel grass is not a true seaweed, but belongs to the pond-weed family, a group of (mostly fresh water) aquatic plants. The seaweeds proper rapidly decompose so that their fertilizing constituents become speedily available, and as they have no power of absorbing liquids, there is no advantage in composting them, and they are best applied directly in the green state. This is not true of eel gress, which more nearly resembles straw. While chemical analysis shows it to have nearly as much nitrogen, phosphoric acid and potash as the seaweeds, it is only with difficulty that they can be made available. Storer says, "It will hardly rot anywhere, either in the ground, in the hog-sty, or in the manure or compost heap."

Seaweeds produce their chief effect the first season. This adds to rather than detracts from their value as a fertilizer, since when they can be obtained at all, they can usually be had one year as well as another, and can be applied annually.

The analyses show that seaweeds are not evenly balanced manures. They contain relatively considerable amounts of nitrogen and potash and but little phosphoric acid. Consequently land dressed for a long time with seaweed alone becomes exhausted in phosphoric acid unless a large excess of manure is added which would be wasteful of the nitrogen and potash. Excellent results have been obtained by using phosphates with these manures. Dissolved bone or acid South Carolina rock may be used, 300 to 500 pounds to the acre, with 20 to 30 tons of the fresh seaweed.

With most crops the best results are obtained by applying the fresh material in the spring and either plowing or harrowing it into the soil, but potatoes and some root crops, like the sugar beet, are said to be injured in quality by spring applications. This is probably due to the large amounts of chlorides of magnesia, sodium, etc., they contain, as it is well known that these substances have the effect of depressing the amount of starch in tubers and thereby impairing the quality. Farmers who make use of this material largely for a potato manure overcome this difficulty to a large extent by applying it to the fields in the fall before planting in the spring. In this way potatoes of much better quality, it is claimed, are grown than by applying the seaweeds at the time of planting.

In some localities seaweed is applied as a top dressing to mowing fields, but if applied fresh in the summer season care must be taken not to apply too thickly, as there is danger of killing out the grass, especially on new fields. Some farmers prefer composting for this purpose with stable manure in order to fine the material so that it will spread more evenly over the field. It is probable that the addition of acid South Carolina rock to the compost would greatly increase its value and aid in holding the ammonia. If the fermentation is carried very far, land plaster or muck should be spread over the heap to prevent ammonia from escaping.

Valued on the basis of commercial fertilizers, seaweeds are worth about $1.50 to $2.00 per ton, as gathered, for the plant food they contain. The humus resulting from the use of seaweeds is of additional value to old fields that have been long cultivated. In southern New England the round and flat-stemmed rockweeds are highly prized by farmers for raising corn, and they frequently pay 5 cents per bushel for it as it is cut from the rocks.

Seaweeds have in common with commercial fertilizers the advantage of freedom from weeds, the spores of fungi and the eggs of insects. Practical farmers in Rhode Island say almost unanimously, that potatoes grown on seaweed are smoother and freer from scab than those grown on stable manure.

## BONE AS MANURE.

While the Station has in the sixteen years of its existence analyzed numerous samples of bone, its investigations have not added greatly to the knowledge of the value of bones as fertilizer. The Station is, however, in frequent receipt of inquiries relative to the value of bone meal as a manure, and because of these inquiries the following is written.

Bones owe their fertilizing value to the nitrogen and the phosphoric acid which they contain. If a bone is soaked for a long time in dilute muriatic acid, the mineral portion is dissolved and a tough pliable mass of the same shape of the original bone is left. This is the organic matter of the bone, composed chiefly of ossein, a nitrogenous material which by long boiling is changed into glue or gelatine. This organic matter makes up from one quarter to one third of the weight of the bone. If a bone is thoroughly burned in fire the organic matter is destroyed and there is left the bone ash. Bone ash is composed chiefly of phosphate of lime, together with a little carbonate of lime and phosphate of magnesia. Raw bone has, in addition to the mineral matter and the ossein, more or less of fats and oils and some water.

When bone or bone ash is treated with strong sulphuric acid, part of the lime is taken away from the bone phosphate of lime and new compounds are found. One of these new compounds is a phosphate of lime containing only one-third as much lime as did the original bone phosphate. The rest of the lime unites with the acid and makes gypsum or land plaster. In practice, if sufficient acid were used to change all the bone phosphate into acid phosphate, the resulting mass would be too pasty and unmanageable for making fertilizers When less acid is added, part of the bone phosphate is changed into the acid phosphate, and part into still another compound which has two-thirds as much lime as the original bone phosphate. The acid phosphate is soluble in water and makes the water soluble phosphoric acid of commercial fertilizers. While the other phosphate is not soluble in water, it is readily available to plants. This is the so-called "reverted" phosphoric acid. The water soluble and the reverted together make up the "available" phosphoric acid of commercial fertilizers. The original prosphate of lime becomes very slowly available as a plant food, while the acidulated phosphate is speedily and completely available. Most of the acidulated phosphate used in the manufacture of fertilizers is not obtained directly from bone, but from bone ash and bone black or from phosphatic rocks, which occur in South Carolina, Florida and other southern states. The acidulated phosphate from rocks is called "dissolved rock" while that from bone ash is called "dissolved bone black." While dissolved bone black commands a higher price than dissolved rock, there is no evidence that the acid phosphate prepared from bone ash is superior as a fertilizer to the acid phosphate from "rock." Bone ash which has not been acted upon by sulphuric acid has comparatively little value as a fertilizer.

### BONE MEAL.

Bone meal differs materially from bone ash, because of the ossein (nitrogenous material) which it contains. When bone meal is buried in moist earth the flesh-like ossein putrifies and its nitrogen becomes available to the growing plant. In its decay the ossein helps somewhat to dissolve the bone phosphate of lime and renders it available. The rapidity of the decay of bone is largely dependent upon its fineness. The Connecticut Experiment Station has adopted an arbitrary scale upon which is based the trade valuations of ground bone. Meal that passes through a sieve of one-fifteenth inch mesh is called "fine" and that which will not so pass is termed "coarse." They value the nitrogen in fine bone and tankage at fourteen cents a pound and in coarse at ten cents. They rate phosphoric acid in "fine" bone and tankage at four cents a pound and in coarse at two cents.

Bone meal has been used for many years in England and Germany where its effects have been carefully studied. These investigations show that bone meal does its best "upon soils that are neither too light and dry nor too close and wet," and that it is of little value on any soil unless the land is well drained and of open texture. Both air and moisture are essential to the fermenting of bone. According to Storer, "bone meal would doubtless answer a good purpose on land newly broken up, and rich in decomposing organic matters, provided the land was neither too stiff nor too dry. So, too, when other conditions are favorable, bone meal will be likely to do better on land full of refuse from a previous crop than on land that has been closely cropped. In New England, it was recognized long ago, by practical men, that bone meal should not be applied to dry soils. It is esteemed in this region, however, for light soils that are fairly moist."

## STEAMED BONE.

For the purpose of feeding, raw bones are undoubtedly superior to steamed because of their higher content of ossein. Recent experiments seem to show that in temperate climates lightly steamed bone, even though it may contain two or three per cent less of nitrogen than raw bone, is of greater fertilizing value than raw bone meal. When bones are placed in a closed boiler and are submitted to steam pressure, the bone becomes not only so friable that it can be readily and cheaply ground, but the chemical character of the ossein left in it appears to be changed. Meal thus made decomposes readily in the earth and according to recent experiments in Germany acts as a quicker and more powerful manure than meal from raw bones. In the manufacture of glue, bone is sometimes treated for a long time with steam at high pressure and thus loses the larger part of its ossein. This bone may carry less than one per cent of nitrogen and approaches bone ash in composition and fertilizing value. The lightly steamed bone offered in the market is probably a better fertilizer for most Maine crops and soils than raw bone meal of equal fineness.

Bone meal is by many highly regarded because it is a slow acting fertilizer, and a single application will last for several years. In present practice slow acting fertilizers are not held in as much repute as formerly. The teaching of Voelcker on this point is coming to be more and more followed. "Greater permancy is no recommendation whatever, for the primary use of all manures is to enable us to grow not scanty but heavy crops; not to deposit on the land fertilizers which may last for three or four years, but by prompt, efficacious action to render a quickly remunerative return from a moderate outlay." The chief objection to the use of bone meal is, indeed, the slowness with which it becomes available.

### THE COMPOSITION OF BONE.

Raw bone usually carries nearly six per cent of nitrogen and a little less than twenty per cent of phosphoric acid. The Maine analyses of locally ground bone meals have been found to vary within not very wide limits. The nitrogen in these meals usually runs from about 3.75 per cent to 4.25 per cent and the phosphoric acid from about twenty-one to twenty-three per cent. The imported bone meals sold by manufacturers of commercial fertilizers will frequently run lower than this, but their composition can be ascertained from the guarantees which the manufacturers place upon the packages. The average bone meals as turned out in the Maine mills can be expected to carry about four per cent of nitrogen and about twenty-two per cent of phosphoric acid.

### BONE MEAL AND WOOD ASHES.

As shown from the above composition, bone meal is not a complete fertilizer in that it contains no potash. The practice which is quite common in Maine of mixing bone meal with wood ashes is a good one, not only because the wood ashes supply the lack of the bone in potash, but help to render the nitrogen and phosphoric acid more quickly available. Just what changes take place when bone and ashes are mixed together, and kept moist, are not as clearly known as is the action of sulphuric acid upon bone phosphate. Probably the potash of the ashes tends to saponify the fat and bring more or less of the other organic matters into solution. If the fermentation goes on in a heap, precautions should be taken to prevent loss of nitrogen. The action of the ashes upon the organic part of the bones causes the mineral part of the bone to disintegrate to a greater or less extent. There is no evidence, however, that the phosphate of lime in the bone undergoes any chemical change because of the ashes, or that it is any more available to the plants, only so far as it may have been made finer. This disintegration or the working down of the bone is undoubtedly important in rendering the mineral matters of the bone more available. A mixture of equal weights of ground, lightly steamed bone and good hard wood ashes would carry about two per cent nitrogen, ten per cent phosphoric acid, and three per cent of potash.

# ANALYSES OF MISCELLANEOUS FOOD MATERIALS.

CHAS. D. WOODS and L. H. MERRILL.

During the past three years the Station has had occasion to make chemical analyses of quite a number of different kinds and classes of materials used as food for man. The specimens were received from various sources, and while the results of the analyses have been used for the specific purposes for which they were made, they are for the most part still unpublished. Because it is believed that the results are of quite general interest, they are here brought together and discussed.

## EGGS OF DOMESTICATED FOWLS.

The compilers of Bulletin 28 of the Office of Experiment Stations of the U. S. Department of Agriculture (the Chemical Composition of American Food Materials) found that, while there had been many (90) analyses of hens' eggs, no other American eggs had been analyzed. Accordingly, at the suggestion of the Director of the Office of Experiment Stations, the following analyses of turkey, goose, duck, and guinea fowl eggs were made.

The turkey eggs (6387) were furnished by the Rhode Island Experiment Station and were thus described by the Director:

"The birds which yielded the eggs sent you for analysis by request of the Office of Experiment Stations were just 'turkey.' I presume they were descendents of bronze turkeys, but they were certainly not pure bred fowls. The eggs were laid rather late (October) which enabled us to send them at that time. They had free range and were apparently healthy, vigorous birds."

The goose eggs (6388) were from the Sunnyfield Poultry Yards, South Portsmouth, R. I.

The duck eggs (6390) were "from pure blood Pekin ducks," and the guinea fowl eggs (6391) "from the ordinary speckled breed" Both samples were furnished by the Maryland Experiment Station.

WEIGHTS OF EGGS, AND WEIGHTS AND PERCENTAGES OF SHELL (REFUSE), WHITE, AND YOLK AS PREPARED FOR ANALYSIS.

| Kind of egg. | Station number. | Individual egg. | Weight as received. | Weight Boiled. | | | | Shell (refuse). | White. | Yolk. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Shell (refuse). | White. | Yolk. | Total.* | | | |
| | | | Grams | Grams | Grams | Grams | Grams | % | % | % |
| Turkey ..... | 6387 | a | 109.6 | 12.2 | 62.2 | 32.4 | 106.8 | 11.4 | 58.3 | 30.3 |
| | | b ... | 104.2 | 11.6 | 59.4 | 30.4 | 101.4 | 11.4 | 58.6 | 30.0 |
| | | c.... | 102.0 | 11.8 | 57.4 | 30.0 | 99.2 | 11.9 | 57.9 | 30.2 |
| | | d .... | 106.4 | 11.4 | 61.4 | 30.6 | 103.4 | 11.0 | 59.4 | 29.6 |
| | | Avg. | 105.5 | 11.7 | 60.1 | 30.9 | 102.7 | 11.4 | 56.5 | 30.1 |
| Goose...... | 6388 | a.... | 195.6 | 23.6 | 101.8 | 66.6 | 192.0 | 12.3 | 53.0 | 34.7 |
| | | b... | 190.4 | 24.6 | 98.0 | 64.0 | 186.6 | 13.2 | 52.5 | 34.3 |
| | | c.... | 171.0 | 24.4 | 89.6 | 55.4 | 169.4 | 14.4 | 52.9 | 32.7 |
| | | d.... | 191.0 | 23.8 | 98.4 | 66.4 | 188.6 | 12.6 | 52.2 | 35.2 |
| | | e.... | 194.0 | 24.4 | 100.4 | 67.2 | 192.0 | 12.7 | 52.3 | 35.0 |
| | | f .... | 200.4 | 24.0 | 102.8 | 69.2 | 196.0 | 12.2 | 32.5 | 35.3 |
| | | Avg. | 190.4 | 24.1 | 98.5 | 64.8 | 187.4 | 12.8 | 52.6 | 34.6 |
| Duck........ | 6390 | a.... | 66.2 | 6.6 | 34.0 | 22.6 | 63.2 | 10.4 | 53.8 | 35.8 |
| | | b.... | 67.6 | 7.0 | 35.2 | 23.2 | 65.4 | 10.7 | 53.8 | 35.5 |
| | | c.... | 72.6 | 7.6 | 37.0 | 25.0 | 69.6 | 10.9 | 53.2 | 35.9 |
| | | d ... | 76.0 | 7.6 | 40.0 | 26.6 | 74.2 | 10.2 | 53.9 | 35.9 |
| | | Avg. | 70.6 | 7.2 | 36.5 | 24.4 | 68.1 | 10.6 | 53.6 | 35.8 |
| Guinea fowl | 6391 | a... | 40.4 | 5.8 | 20.4 | 13.2 | 39.4 | 14.7 | 51.8 | 33.5 |
| | | b.... | 41.8 | 6.2 | 22.4 | 11.4 | 40.0 | 15.5 | 56.0 | 28.5 |
| | | c.... | 38.8 | 5.2 | 19.6 | 12.8 | 37.6 | 13.8 | 52.2 | 34.0 |
| | | d.... | 39.6 | 5.2 | 21.0 | 12.6 | 38.8 | 13.4 | 54.1 | 32.5 |
| | | Avg. | 40.2 | 5.6 | 20.9 | 12.5 | 39.0 | 14.4 | 53.6 | 32.0 |
| Hens' †...... | .... | ....... | ..... | ...... | ...... | ...... | ...... | 11.2 | .... | ....... |

*The decrease in weight includes loss in preparation of sample, as well as diminished weight due to cooking.

† Average of 34 samples, page 53, Bulletin 28 of the Office of Experiment Stations.

WEIGHT OF NUTRIENTS AND FUEL VALUE OF 1 POUND OF EGGS.

| Station number. | Kind of Eggs. | Refuse (shells). | Water. | Protein. Nitrogen × 6.25. | Protein. By difference. | Fat. | Ash. | Fuel value per pound. |
|---|---|---|---|---|---|---|---|---|
| | White of eggs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Calo. |
| 6387 | Turkey eggs | ...... | .867 | .115 | .125 | Trace. | .008 | 325 |
| 6388 | Goose eggs | ..... | .863 | .116 | .129 | Trace. | .008 | 330 |
| 6390 | Duck eggs | ..... | .870 | .111 | .122 | Trace. | .008 | 315 |
| 6391 | Guinea fowl eggs | ...... | .866 | .116 | .126 | Trace. | .008 | 325 |
| | Hens' eggs * | ...... | .862 | .123 | .130 | .002 | .006 | ..... |
| | Yolk of eggs. | | | | | | | |
| 6387 | Turkey eggs | ...... | .483 | .174 | .176 | .329 | .012 | 1875 |
| 6388 | Goose eggs | ...... | .441 | .173 | .184 | .362 | .013 | 1975 |
| 6390 | Duck eggs | . .. | .458 | .168 | .168 | .362 | .012 | 1980 |
| 6391 | Guinea fowl eggs | ..... | .497 | .167 | .173 | .318 | .012 | 1800 |
| | Hens' eggs * | ..... | .495 | .157 | .161 | .333 | .011 | ...... |
| | Edible portion (white and yolk). | | | | | | | |
| 6387 | Turkey eggs | ..... | .737 | .134 | .142 | .112 | .009 | 850 |
| 6388 | Goose eggs | ... | .695 | .138 | .151 | .144 | .010 | 985 |
| 6390 | Duck eggs | ..... | .705 | .133 | .140 | .145 | .010 | 985 |
| 6391 | Guinea fowl eggs | ... . | .728 | .135 | .143 | .120 | .009 | 875 |
| | Hens' eggs † | ...... | .737 | .134 | .148 | .105 | .010 | ..... |
| | As purchased (including shell). | | | | | | | |
| 6387 | Turkey eggs | .138 | .635 | .116 | .122 | .097 | .008 | 735 |
| 6388 | Goose eggs | .142 | .597 | .115 | .129 | .123 | .009 | 860 |
| 6390 | Duck eggs | .137 | .609 | .115 | .121 | .125 | .008 | 880 |
| 6391 | Guinea fowl eggs | .169 | .606 | .112 | .119 | .099 | .007 | 730 |
| | Hens' eggs † | .112 | .655 | .119 | .131 | .093 | .009 | ...... |

* Average of 11 analyses, page 54, Bulletin 28, of the Office of Experiment Stations.
† Average of 60 analyses, page 54, Bulletin 28, of the Office of Experiment Stations.

PREPARATION OF EGGS FOR ANALYSIS.

The analyses were made in the usual way by the official methods. The samples were prepared for analysis as follows:

The eggs as received were weighed individually and then "hard-boiled." Upon cooling each egg was weighed. The shells, whites, and yolks of each egg were carefully separated and weighed. The shells were then rejected. The whites as well as yolks were chopped with a chopping knife and tray till the pieces were about the size of kernels of wheat. The samples were then weighed and partially dried at a temperature of 45° C. After partially drying the samples were weighed and ground in a mortar. No attempt was made to determine the lecithins which were largely included in the fats.

The detailed weights and the results of the analyses are given in the preceding tables.

There is a great similarity in the proportion of shell, white and yolk in the eggs of the different domesticated fowl. Roughly speaking, the shell makes up about one-ninth, the yolk one-third, and the white about five-ninths of the whole eggs. The white of the egg is nearly seven-eighths water. The solids of the white are practically all nitrogenous matters and are sometimes said to be pure albumen. The Connecticut State Experiment Station has made an extended investigation of the white of hens' eggs and finds that it consists of four different though quite closely allied albuminoids. The usual factor for protein (nitrogen multiplied by 6.25) is apparently too small, and the protein "by difference" is probably the more accurate. It will be noted that the white of the different kinds of eggs are practically alike in composition and fuel values.

While the yolks of different kinds of eggs differ rather more in composition than the whites they are still remarkably alike. The yolk is rather less than half water. The solids are more than three-fifths soluble in ether. This ether extract consists of the ordinary fats (palmitin, stearin, and olein) and a small amount of other materials. The yolk is very complex in composition and the classes of nutrients are only approximately separated in the usual food analysis. It will be noted the protein "by difference" and "by factor" are practically the same and that the fuel value varies with the fat content from 1,800 calories per pound in the guinea fowl eggs with 31.8 per cent of fat, to 1,975 and 1,980 calories per pound in the duck and goose eggs with 36.2 per cent fat.

### Egg Substitutes and Dried Eggs.

Because of the high price at which eggs are sold at certain seasons of the year and because of the readiness with which eggs loose their freshness, many attempts to produce satisfactory egg substitutes have been made. Some of the so-called egg substitutes consist chiefly of starch. These here reported upon are of animal origin and correspond somewhat nearly to eggs in their composition with the exception that they contain much less water and more of solid matter.

Because of the small amount of water and the high protein content, evaporated eggs resemble the concentrated foods described on pages 100-107 beyond. That they are used in this way in large quantities is illustrated by the fact that in 1898 the manufacturers of LaMont's Crystallized Eggs shipped over 100,000 pounds, equivalent to 400,000 dozen eggs, to the South African miners.

Ovine, (6389) made by Munroe & Co., 100 Maiden Lane, New York City, "takes the place of fresh eggs in baking." The directions state that "one ounce of Ovine is equivalent to five eggs. Take the required amount of Ovine (one heaped-teaspoonful about equal to one egg) and sift well with the flour. The more even the mixture, the better it will work. Use an ample amount of baking powder or yeast. Work the dough well. Less butter is needed for shortening if Ovine is used in place of eggs."

From the analysis below it will be noted that Ovine resembles the white of egg much more nearly than it does the entire egg. It has practically no fat and consists chiefly of nitrogenous matter. The analysis does not in any way explain why the makers should claim that it takes the place of "shortening," i. e., fat, as it contains practically none.

LaMont's Crystallized Egg (6395 and U. S. Department of Agriculture, No. 20496) is manufactured by C. Fred LaMont, St. Louis, Mo. "Simply fresh eggs with the water expelled. Dissolves readily in cold or luke warm water or milk." "Not a substitute but guaranteed simply shell eggs desiccated." Egg

Flake (U. S. Department of Agriculture No. 20524) and Crystallized Egg each have a composition corresponding to dried eggs without the shell, and give every indication of being desiccated eggs as claimed.

WEIGHTS OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF EGG SUBSTITUTES AS FOUND IN THE MARKET.

| Laboratory number. | Name. | Water. | Protein. Nitrogen × 6.25. | Protein. By difference. | Fat. | Ash. | Fuel value per pound. |
|---|---|---|---|---|---|---|---|
| | | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Calo. |
| 6389 | Ovine .......................... | .114 | .739 | .792 | .003 | .091 | 2105 |
| 6395 | Crystallized Egg (LaMont) .... | .075 | .471 | .554 | .338 | .033 | 2945 |
| 20496 | Crystallized Egg (LaMont)*..... | .050 | .486 | .555 | .356 | .039 | |
| | Crystallized Egg (LaMont)..... Average .......... ........ | .062 | .479 | .555 | .347 | .036 | |
| 20524 | Egg Flake* ..................... | .068 | .452 | .512 | .385 | .035 | |

*Analysis (unpublished) by the Chemical Division of the U. S. Department of Agriculture.

## Prepared Flours.

After the publication of the analyses of cereal foods in Bulletin 55 of this Station, quite a number of inquiries were received relative to self-raising flours. While inquiry among the dealers gave evidence that these goods were not very greatly used in the State, it was thought best to obtain samples for analysis of the brands more commonly sold.

As acid phosphate is cheaper than tartaric acid and as alum is a low-priced adulterant of baking powder, the samples were examined for these materials. The description of samples and results of the analysis follow. Beyond the table a discussion of these materials is given.

6396. Aunt Jemima's Pancake Flour. R. T. Davis Mill Co., St. Joseph, Mo.

"Pure and healthful." "It is made of the three staffs of life." "Wheat, corn and rice."

6397. Uncle Jerry's New England Corn and Rice Pancake Flour. I. Pieser & Co., 130-132 Washington St., Chicago, Ill.

"In this preparation we use corn, potatoes, wheat and rice." "Formula 92¼% wheat, rice corn and potatoes, 2½% salt, 5¼% leavening."

6398. Uncle Jerry's New England Self-Raising Buckwheat Flour. I. Pieser & Co., 130-132 Washington St., Chicago, Ill.

"Compound: 70% buckwheat flour, 20% wheat flour, 10% corn flour, and sufficient seasoning and leavening."

6399. Reliable Self Raising Prepared Flour. Reliable Flour Company, Boston, Mass.

"This reliable flour is made from the choicest selected wheat." "An absolutely pure cream of tartar preparation."

6400. Hecker's Superlative Self-Raising Flour. Hecker-Jones-Jewell Milling Co., New York.

"Mixture of pure flour and wholesome phosphatic leavening materials." "These goods conform strictly to the pure food laws of Pennsylvania." "Mixture of wheat flour, phosphate, soda and salt."

6401. U-re-ka Self Raising Prepared Flour. Ureka flour Co., Portland, Maine.

"Mixed Flour. Made of wheat flour, pure grape cream of tartar, bi-carbonate of soda and salt."

6402. Purina Health Pancake Flour. Purina Mills, St. Louis, Mo.

"Made from Purina health flour (whole wheat), corn flour, salt and the leavening properties—phosphate and soda.

6403. Century Health Self-Raising Pancake Flour. Purina Mills, St. Louis, Mo.

"Made of health products only, consisting principally of gluten whole wheat flour."

6404. Cereal Pancake Flour. The Cream Cereal Company, Xenia, Ohio.

"Guaranteed a purely grain product." "Absolutely free from adulterations of any kind." "A pop corn product."

6405. Swan's Down Prepared Cake Flour. Ingleheart Bros., Evansville, Ind.

"Prepared strictly from the purest and best winter wheat." "This is not self-raising flour."

WEIGHT OF TOTAL AND AVAILABLE CARBON DIOXIDE, ALUM AND PHOSPHORIC ACID IN ONE POUND OF PREPARED FLOUR.

| Laboratory number. | Name. | Total carbon dioxide. | Available carbon dioxide. | Alum. | Phosphoric acid. |
|---|---|---|---|---|---|
| | | Lbs. | Lbs. | Lbs. | Lbs. |
| 6396 | Aunt Jemima's Pancake Flour | .0027 | .0024 | .......... | .0079 |
| 6397 | Uncle Jerry's Pancake Flour | .0055 | .0045 | .0034 | .0033 |
| 6398 | Uncle Jerry's Buckwheat Flour | .0056 | .0037 | .......... | .0001 |
| 6399 | Reliable S-R Prepared Flour | .0073 | .0062 | .0027 | .0001 |
| 6400 | Hecker's Superlative S-R Flour | .0065 | .0056 | .......... | .0089 |
| 6401 | Ureka S-R Prepared Flour | .0058 | .0032 | .......... | .0010 |
| 6402 | Purina Health Pancake Flour | .0072 | .0052 | .......... | .0033 |
| 6403 | Century Health S-R Pancake Flour | .0037 | .0017 | .0019 | .0009 |
| 6404 | Cereal Pancake Flour | .0048 | .0042 | .0022 | .0003 |

WEIGHTS OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF PREPARED FLOURS.

| Laboratory number. | Name. | Water. | Protein (N × 6.25). | Fat. | Carbohydrates. | Ash. | Fuel value per pound. |
|---|---|---|---|---|---|---|---|
| | | Lb. | Lb. | Lb. | Lb. | Lb. | Calo. |
| 6396 | Aunt Jemima's Pancake Flour | .089 | .094 | .006 | .761 | .050 | 1705 |
| 6397 | Uncle Jerry's Pancake Flour | .090 | .107 | .007 | .746 | .050 | 1680 |
| 6398 | Uncle Jerry's Buckwheat Flour | .091 | .109 | .012 | .730 | .058 | 1670 |
| 6399 | Reliable S-R Prepared Flour | .090 | .090 | .008 | .782 | .030 | 1690 |
| 6400 | Hecker's Superlative S-R Flour | .094 | .091 | .009 | .758 | .048 | 1650 |
| 6401 | Ureka S-R Prepared Flour | .090 | .089 | .009 | .787 | .025 | 1710 |
| 6402 | Purina Health Pancake Flour | .089 | .100 | .016 | .738 | .057 | 1670 |
| 6403 | Century Health S-R Pancake Flour | .086 | .099 | .009 | .750 | .056 | 1680 |
| 6404 | Cereal Pancake Flour | .080 | .122 | .028 | .727 | .046 | 1740 |
| 6405 | Swan's Down Prepared Cake Flour | .098 | .103 | .008 | .792 | .002 | 1470 |

The chief variation of a self-raising flour from a typical flour of the same grade is found in its higher ash content. A pound of straight patent flour will have about .005 pounds of ash. The ash in 1 pound of the self-raising flours (6405 is not self-raising) varies from .025 to .058 pounds. This added ash consists of common salt, and leavening materials. Patent flour usually carries about .002 pounds of phosphoric acid to the pound. Larger amounts than this in a self-raising flour indicates that acid phosphate has been added in the leavening. The use of phosphoric acid in place of cream of tartar is perfectly proper and indeed on some accounts preferable. Alum should not be present in flour. In small amounts its presence may be accidental. When as much as .002 pound occurs in a pound it is fair to assume that it was added intentionally. Alum is harmful and should not be used in flours or baking powders.

The amount of leavening is measured by the carbon dioxide which is evolved when the flour is wet up with water and heated. As shown by the analyses the total leavening power may be considerably in excess of the available, the proportion of the latter decreasing with age. If chemical leavening agents are to be used, it is far better to mix them with the flour at the time of baking.

Good bread flour with sufficient cream of tartar and soda as leavening material costs about 3 cents a pound. The ready prepared flours here reported upon were sold at the rate of 5.3 to 16.1 cents per pound. Because of the high cost, the poor keeping quality and the temptation to adulteration, from the standpoint of economy and health, the general use of prepared self-raising flours is unwise.

## PEA FLOUR.

A five pound package of pea flour sent by Dr. Charles Caldwell of Chicago to the Department of Agriculture was forwarded to the laboratories of this Station for analysis. Dr. Caldwell regards the flour as a very promising addition to our food products. He recommends that it be mixed with wheat flour and used for bread making, "since it not only improves the flavor of the bread, but its texture as well, the loaf remaining soft and moist much longer than when wheat flour alone is employed." He suggests that it be compressed into cakes and used as an army ration. Its preparation is supposed to include steam cooking, roasting and reduction by the roller process. It is light sulphur-yellow in color and nearly as fine as ordinary wheat flour. Its composition is given in the following table, together with that of dried peas and wheat flour.

WEIGHT OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF PEA FLOUR, DRIED PEAS, AND WHEAT FLOUR.

| | Water. | Protein (N × 6.25). | Fat. | Carbohydrates. | Ash. | Fuel value. |
|---|---|---|---|---|---|---|
| | Lb. | Lb. | Lb. | Lb. | Lb. | Calo. |
| Pea Flour, 6430 | .078 | .284 | .019 | .587 | .032 | 1884 |
| Dried peas * | .095 | .246 | .010 | .620 | .029 | 1665 |
| Wheat Flour † | .126 | .117 | .014 | .738 | .005 | 1763 |

* Bulletin 28, Office Experiment Station, p. 67.
† Average of 21 analyses made at this Station.

The pea flour is very rich in protein, containing nearly two and one-half times as much as wheat flour. If the product were placed upon the market at a moderate price it seems quite probable that it would find a ready use.

## Gluten Foods.

In Bulletin 55 of this Station the analyses were given of several so-called gluten preparations which carried "only a little more protein and a little less carbohydrates than ordinary flour."

As a result of the publication of these analyses, we have received many letters from people suffering with diabetes asking for information relative to gluten preparations high in protein and low in carbohydrates. The Pure Gluten Food Company of New York claim that their goods are high in gluten and low in starch. These claims are substantiated by the analyses of samples which follow:

Breakfast Cereal Pure Gluten, (6342). The Pure Gluten Food Company, New York. "The Strength of the Wheat.

Gluten Breakfast Cereal is entirely free from starch and has received the highest medical endorsement for the treatment of diabetes, dyspepsia, obesity and Bright's disease. Gluten Breakfast Cereal is rich in nitrates and phosphates, the essentials in upbuilding and strengthening the tissues, muscles, nerves and bone. It contains none of the heating properties found in the cereals. It promotes perfect digestion."

Plain Gluten Flour, Pure Gluten, (6343). The Pure Gluten Food Company, N. Y.

"The ideal flour for diabetes, dyspepsia, obesity and Bright's disease. For making bread and crackers. Pure gluten flour is entirely free from starch and contains all the properties for muscle and fiber building. Our gluten preparations have received the highest medical endorsement. We invite comparison and chemical analysis."

Self-Raising Flour, Pure Gluten, (6344). The Pure Gluten Food Company.

"Pure Gluten Self-Raising Flour is the ideal preparation for making self-raising pancakes, muffins and gems. It contains all the nitrates or muscle and fibre producing qualities, and being entirely free from starch, it has none of the heating properties of other pancake flours, and will not therefore disturb digestion, nor produce derangements incident to warm weather. As a pancake or gem flour for diabetics and dyspeptics, it is incomparable in nutritive worth."

WEIGHT OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF THE PURE GLUTEN FOOD COMPANY'S GLUTEN PREPARATIONS.

| Station number. | | Water. | Protein. | Fat. | Crude fiber. | N-free extract. | Ash. | Fuel value per pound. |
|---|---|---|---|---|---|---|---|---|
| | | Lb. | Lb. | Lb. | Lb. | Lb. | Lb. | Calo. |
| 6342 | Breakfast Cereal | .093 | .437 | .016 | .003 | .444 | .007 | 2060 |
| 6343 | Plain Gluten Flour | .099 | .536 | .012 | .002 | .345 | .006 | 2150 |
| 6344 | Self-Raising Flour | .098 | .315 | .014 | .003 | .532 | .038 | 1885 |

## Condensed Foods.

Within a few years there has been placed upon the market a considerable number of condensed or concentrated foods, designed for the use of armies, or for explorers, sportsmen and others, to be used under conditions that render it desirable to reduce weight and space to the minimum. The constantly increasing number of these articles indicates a correspondingly increased demand. How far the want has been met can, to a certain extent, be determined by a study of the analyses recently made at this Station and here reported.

CONDENSED FOODS. DESCRIPTION OF SAMPLES.

| Laboratory number. | Brands and Manufacturers. |
|---|---|
| 6323 | Ration Cartridge, Pea, Beef, etc., Bovril, Limited, London. |
| 6324 | Campaigning Foods, Blue Ration, Bovril, Limited, London. |
| | a Meat Albuminoids. b Chocolate Basis. |
| 6325 | Campaigning Foods, Red Ration, Bovril, Limited, London. |
| | a Meat Albuminoids. b Chocolate Basis. |
| 6326 | Ration Cartridge, Potatoes, Beef, etc., Bovril, Limited, London. |
| 6327 | Emergency Ration, Bovril, Limited, London. |
| | a Meat Extractive Basis. b Chocolate Basis. |
| 6328 | Emergency Ration, Bovril, Limited, London. |
| | a Concentrated Beef. b Cocoa Paste. |
| 6321 | Nao Complete Meat Food, The Military Equipment Stores andTortoise Tents Co., London. |
| 6322 | Army Rations, Mutton and Vegetables, Maconochie Bros., London. |
| 6332 | Standard Emergency Ration, American Compressed Food Co., Passaic, N. J. |
| 6333 | Standard Emergency Ration, American Compressed Food Co., Passaic, N. J. |
| | a Tablet. b Chocolate. |
| 6335 | Arctic Food, Arctic Food Company, Minneapolis, Minn. |
| 6334 | Tanty Emergency Ration, Tanty Cuisine, New York City. |
| 6341 | F. A. F. Co's Beef-Vegetable Stew, Franco-American Food Co., Jersey City Heights. |
| 6407 | Toril Beef Tea, Toril Albumen & Extract of Meat Co., Altoona-Hamburg. |
| 6306 | Soson, Toril Albumen & Extract of Meat Co., Altoona-Hamburg, Germany. |
| 6329 | Tropon, Troponwerke, Mulheim-Rhein. |
| 6429 | Plasmon, American Syndicate, New York City. |
| 6330 | Pain-de-guerre. |

A large proportion of the foods examined were of English manufacture and may be classed under the general head of "emergency rations"—i. e., rations that, without fully satisfying the needs of the body, may still enable the consumer to continue his active pursuits for a few days without an appreciable loss of strength. Of the other articles examined, 3 consist chiefly of proteids and are designed not as a food in the general sense, but rather as articles of dietetic therapy. The results of the analyses follow:

WEIGHTS OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF CONDENSED FOODS.

| Laboratory number. | Brand. | Water. | Protein. | Fat. | Carbohydrates. | Ash. | Fuel value per pound. |
|---|---|---|---|---|---|---|---|
| | | Lb. | Lb. | Lb. | Lb. | Lb. | Calo. |
| 6323 | Ration Cartridge | .142 | .219 | .174 | .407 | .058 | 2016 |
| 6324 | Blue Ration a. | .450 | .222 | .054 | .224 | .050 | 1160 |
| 6324 | Blue Ration b. | .013 | .072 | .296 | .601 | .018 | 2536 |
| 6325 | Red Ration a | .277 | .215 | .151 | .310 | .047 | 1843 |
| 6325 | Red Ration b | .016 | .064 | .299 | .605 | .016 | 2497 |
| 6326 | Ration Cartridge | .416 | .220 | .045 | .270 | .049 | 1237 |
| 6327 | Emergency Ration a. | .122 | .468 | .246 | .099 | .065 | 2333 |
| 6327 | Emergency Ration b. | .017 | .072 | .290 | .602 | .019 | 2497 |
| 6328 | Emergency Ration a. | .037 | .594 | .269 | .055 | .045 | 2909 |
| 6328 | Emergency Ration b. | .045 | .065 | .121 | .747 | .022 | 2099 |
| 6321 | Nao Meat Food | .529 | .130 | .206 | .106 | .029 | 1378 |
| 6322 | Army Rations | .636 | .153 | .128 | .072 | .011 | 1058 |
| 6332 | Standard Emergency Ration | .056 | .310 | .216 | .384 | .034 | 2385 |
| 6333 | Standard Emergency Ration a | .063 | .188 | .203 | .507 | .039 | 2356 |
| 6333 | Standard Emergency Ration b | .010 | .066 | .214 | .694 | .016 | 2349 |
| 6335 | Arctic Food | .072 | .178 | .396 | .283 | .071 | 2606 |
| 6334 | Tanty Emergency Ration | .660 | .127 | .102 | .088 | .023 | 910 |
| 6341 | F. A. F. Co's Stew | .662 | .155 | .119 | .054 | .010 | 978 |
| 6407 | Toril Beef Tea | .156 | .423 | .003 | .164 | .254 | 1009 |
| 6406 | Soson | .064 | .931 | .002 | ........ | .003 | 2444 |
| 6329 | Tropon | .092 | .885 | .003 | .012 | .008 | 2317 |
| 6429 | Plasmon | .085 | .750 | .002 | .089 | .074 | 2044 |
| 6330 | Pain de-guerre | .106 | .108 | .005 | .768 | .013 | 1719 |

The samples of concentrated foods were all received through the Office of Experiment Stations of the U. S. Department of Agriculture. Capt. E. L. Munson, surgeon of the U. S. Army, was making investigations of concentrated foods on the market with the especial purpose of studying their adaptability for army purposes in the Tropics. As a result of his inquiry, he obtained the samples herewith reported which were forwarded here for analysis.

CONDENSED FOODS. WEIGHT OF PACKAGE AND CONTENTS.

| Laboratory number. | Brand. | Weight of original package. | Weight of Contents. | | |
|---|---|---|---|---|---|
| | | | Total. | a. | b. |
| | | Grams | Grams | Grams | Grams |
| 6323 | Ration Cartridge, Pea, Beef, etc | 320 | 241 | ........ | ........ |
| 6324 | Blue Ration, Campaigning Food | 340 | 247 | 169 | 78 |
| 6325 | Red Ration, Campaigning Food | 274 | 199 | 122 | 77 |
| 6326 | Ration Cartridge, Potatoes, Beef, etc | 382 | 283 | ........ | ........ |
| 6327 | Emergency Ration | 330 | 233 | 120 | 113 |
| 6328 | Emergency Ration | 319 | 248 | 121 | 127 |
| 6321 | Nao Meat Food | 583 | 437 | ........ | ........ |
| 6322 | Army Rations | 823 | 661* | ........ | ........ |
| 6332 | Standard Emergency Ration | 540 | 418† | ........ | ........ |
| 6333 | Standard Emergency Ration | 402 | 319 | 270 | 49 |
| 6335 | Arctic Food | 444 | 422 | ........ | ........ |
| 6334 | Tanty Emergency Ration | 585 | 475 | ........ | ........ |
| 6341 | F-A Food Company's Stew | 1151 | 964 | ........ | ........ |
| 6407 | Toril Beef Tea | Broken package | ........ | ........ | ........ |
| 6406 | Soson | Broken package | ........ | ........ | ........ |
| 6329 | Tropon | 245 | 224 | ........ | ........ |
| 6429 | Plasmon | 490 | 453 | ........ | ........ |
| 6330 | Pain-de-guerre | 55 | 55 | ........ | ........ |

* Excluding 26 grams bone.

† Not including a tablet of tea, 18 grams, and two small boxes of pepper and salt, 6 grams.

CONDENSED FOODS. GRAMS OF NUTRIENTS IN PACKAGE.

| Laboratory number. | Brands. | Net weight contents. | WEIGHT OF MATERIALS IN PACKAGE. Water. | Protein. | Fats. | Carbohydrates. | Ash. | Total fuel value. |
|---|---|---|---|---|---|---|---|---|
| | | Gms | Grams | Grams | Grams | Grams | Gms | Calo. |
| 6323 | Ration Cartridge..... ......... | 241 | 34.2 | 52.9 | 42.0 | 98.0 | 13.9 | 1071 |
| 6324 | Blue Ration a.................. | 169 | 76.1 | 37.5 | 9.0 | 37.9 | 8.5 | 432 |
| 6324 | Rlue Ration b............ .... | 78 | 1.0 | 5.6 | 23.1 | 46.9 | 1.4 | 436 |
| 6325 | Red Ration a. ................ | 122 | 33.8 | 26.2 | 18.5 | 37.8 | 5.7 | 496 |
| 6325 | Red Ration b. ........... ...... | 77 | 1.2 | 5.0 | 23.0 | 46.6 | 1.2 | 424 |
| 6326 | Ration Cartridge......... . ... | 283 | 117.9 | 62.3 | 12.6 | 76.4 | 13.8 | 772 |
| 6327 | Emergency Ration a.......... | 120 | 14.6 | 56.1 | 29.6 | 11.9 | 7.8 | 617 |
| 6327 | Emergency Ration b.. . ...... | 113 | 1.9 | S.2 | 32.7 | 68.0 | 2.2 | 622 |
| 6328 | Emergency Ration a........... | 121 | 4.5 | 71.8 | 32.6 | 6.7 | 5.4 | 776 |
| 6328 | Emergency Ration b ... ...... | 127 | 5.7 | 8.3 | 15.3 | 94.8 | 2.9 | 588 |
| 6321 | Nao Meat Food.... ............ | 437 | 231.3 | 56.9 | 90.1 | 46.2 | 12.5 | 1328 |
| 6322 | Army Rations ..... ............ | 661 | 420.2 | 101.2 | 84.3 | 47.9 | 7.4 | 1542 |
| 6332 | Standard Emergency Ration.. | 418 | 23.6 | 129.6 | 90.5 | 160.3 | 14.0 | 2198 |
| 6333 | Standard Emergency Ration a | 270 | 17.0 | 50.6 | 54.8 | 137.0 | 10.6 | 1402 |
| 6333 | Standard Emergency Ration b | 49 | .5 | 3.2 | 10.5 | 34.0 | .8 | 254 |
| 6335 | Arctic Food .... .... ......... | 423 | 30.7 | 75.1 | 167.3 | 119.8 | 30.1 | 2430 |
| 6334 | Tanty Emergency Ration ..... | 475 | 313.5 | 60.2 | 48.6 | 41.9 | 10.8 | 1482 |
| 6341 | F-A-F Company's Stew ........ | 964 | 638.0 | 149.2 | 114.5 | 52.5 | 9.8 | 2460 |
| 6329 | Tropon.. ...................... | 224 | 20.5 | 198.2 | .7 | 2.7 | 1.9 | 1144 |
| 6429 | Plasmon ........................ | 453 | 38.7 | 339.8 | .8 | 40.3 | 33.4 | 2041 |
| 6330 | Pain-de-guerre. ................ | 55 | 5.9 | 5.9 | .3 | 42.2 | .7 | 208 |

The six preparations bearing the mark of Bovril, Limited, 30 Farringdon St., London, are all put in tin cans in the form of flattened cylinders with rounded ends. These vary in length from 4½ to 7 inches and are easily opened by means of the key attached. All contain dried meats, in most cases mixed with vegetables, the whole ground and compressed. Four of the tins are made with a compartment containing one or more cakes of chocolate wrapped in tin foil. The inscription upon one of these cans (6327) is here given in full:

"Emergency Ration. Field service. This ration is not to be opened except by order of an officer, or in extremity. It is to be carried in the haversack and produced at inspections, etc. The ration is calculated to maintain strength for 36 hours if eaten in small quantities at a time." (Upon one end of the can) "Basis Meat Extractives and Albuminoids. May be used dry with or without biscuits, or as a soup one-fourth part boiled for 15 minutes in one pint of water." (On the other end of the can) "Chocolate Basis. The contents may be used dry, or one-fourth boiled in one pint of water. Bovril, Limited, London."

The Bovril goods, the Standard Emergency Rations, and Arctic Food may for convenience be classed together. It may be said of them all that they appear to be good articles and when prepared according to directions would probably furnish appetizing dishes, subject, of course, to the limitations common to all canned goods. The emergency rations 6327 and 6328 are "calculated to maintain strength for 36 hours if eaten in small quantities at a time." No direct claim of the kind is made for the other Bovril goods, though the statement that the Red Ration Cartridge (6323 and 6325) is "recommended to be used on alternate days with the Blue Ration Cartridge" (6324 and 6326), seems to imply that each of these cartridges is sufficient for a day. The package containing the Standard Emergency Ration, 6332, is said to contain "enough palatable food and drink to sustain one man for one day under all conditions." The Standard Emergency, (6333), is said to be sufficient for two hearty meals. These claims may very properly be considered here.

Various estimates have been made as to man's daily needs. These estimates have been based either upon a study of the daily waste of the body, or upon direct nutrition experiments, in which the daily food has been gradually reduced until a maintenance ration has been struck. While these estimates must vary not only with the individual, but with the habits and other conditions of the subject, an average may be fixed upon which is sufficiently exact for our present purposes. Of the standards given, those of Moleschott in Germany and Atwater in this country are perhaps as frequently quoted as any.

Moleschott gives the following diet as sufficient for a man performing a moderate amount of work:

| | |
|---|---|
| Protein .......................... | 120 grams. |
| Fats ............................ | 90 grams. |
| Carbohydrates .................... | 330 grams. |

This gives a total weight of 540 grams, or about 1 1-5 pounds of dry matter per day. By the use of the proper factors, we find that such a diet has a fuel value of 2,680 calories. That is, these quantities of nutrients, in the metabolic processes which they undergo in the body, yield an amount of heat sufficient to raise 2,680 kilograms of water 1° C., or about 5 tons of water 1° F.

It is an interesting fact that what constitutes an adequate diet for the European does not satisfy the American workman. By a study of dietaries in this country Atwater has found that a man at moderate labor requires daily about 125 grams proteids, with enough fats and carbohydrates to bring the fuel value up to 3,500 calories, an advance of about 30 per cent over Moleschott's estimate. This required fuel value may be supplied by adding to the 125 grams proteids, 100 grams fats, and 502 grams carbohydrates. In the following table these European and American estimates are compared.

| | European. | | American. | |
|---|---|---|---|---|
| | Grams. | Calories. | Grams. | Calories. |
| Protein.......................... | 120 | 492 | 125 | 512 |
| Fats............................. | 90 | 837 | 100 | 930 |
| Carbohydrates.................... | 330 | 1353 | 502 | 2058 |
| Total............................ | 540 | 2682 | 727 | 3500 |

In the following tables these standards are compared with the contents of the packages concerning which the previously mentioned claims are made. Since 6327 and 6328 are said to be sufficient for 36 hours, two-thirds of the contents of the package are taken as the basis for calculation. The emergency ration 6333 is said to suffice for two meals; in the table the contents are therefore increased by one-half to correspond with one day of three meals.

DIETARY STANDARDS COMPARED WITH CONDENSED FOOD RATIONS

| Laboratory number. | | Protein. | Fats. | Carbohydrates. | Calories. |
|---|---|---|---|---|---|
| | | Grams. | Grams. | Grams. | |
| | European Standard | 120.0 | 90.0 | 330.0 | 2682 |
| | American Standard | 125.0 | 100.0 | 502.0 | 3500 |
| 6327 | Emergency Ration | 42.9 | 41.5 | 53.3 | 780 |
| 6328 | Emergency Ration | 53.4 | 31.9 | 67.7 | 793 |
| 6323 | Red Ration | 52.9 | 42.0 | 98.0 | 1009 |
| 6325 | Red Ration | 31.2 | 41.5 | 84.4 | 860 |
| 6324 | Blue Ration | 43.1 | 32.1 | 84.8 | 823 |
| 6326 | Blue Ration | 62.3 | 12.6 | 76.4 | 686 |
| 6332 | Standard Emergency Ration | 129.6 | 90.5 | 160.3 | 2030 |
| 6333 | Standard Emergency Ration | 80.7 | 98.0 | 256.5 | 2294 |

The comparisons made in the table show that for the most part the claims are extravagant. With the exception of the two last given, none of the packages supply more than one-half the protein required to replace the waste of one day, and not more than one-fourth or one-third of the potential energy called for by the standards. Indeed a little thought would have shown that no ration containing less than one and one-half pounds of dry matter can supply the waste of the active adult human body. If we refer once more to the standards given, we will see that even if a food could consist of absolutely pure protein, fats and carbohydrates, it must contain from 540 to 727 grams, or from one and one-fifth to one and three-fifths pounds. In practice such a food is impossible. In addition to the water and waste matters invariably present, there will always be a varying amount of mineral salts in our food, a certain proportion of which is just as essential to our existence as any one of the three nutrients already considered. While an amount of food under one and one-half pounds may constitute a valuable "emergency ration," the continued use of such a diet must inevitably result in a reduction in strength and body weight.

The Pain-de-guerre is an evaporated bread used as a concentrated ration in the French army. The process of manufacture is secret. The sample as received consisted of a single biscuit, about 2½ inches long and 1 inch thick, weighing less than two ounces (55 grams). It is said when it is moistened the Pain-de-guerre takes up a great deal of water and swells so that it has the appearance of soft bread rather than that of a cracker. Because of the smallness of the sample, this property was not tested. Its chemical analysis would seem to indicate that it is made entirely of wheat with which it agrees quite closely in composition.

### MALTED NUTS.

Malted Nuts. (6178). Manufactured by the Sanitas Nut Food Co., Ltd., Battle Creek, Mich.

"A perfect food, can be used to the exclusion of all other foods for infants or other persons, is suited to all ages and possesses all the essentials of a perfect nutrient. Malted nuts is not a chemical mixture of food elements, but a simple preparation of natural products, predigested and otherwise prepared for prompt and perfect assimilation."

As shown below, the claimed analysis on the wrapper corresponds closely with the results of the analysis of the sample here reported upon.

WEIGHT OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF MALTED NUTS AS CLAIMED BY THE MANUFACTURERS AND FOUND BY ANALYSIS.

| Claimed Analyses. | Lbs. | Analyses here Reported. | Lbs. |
|---|---|---|---|
| Water | .045 | Water | .026 |
| Vegetable Albumin | .236 | Protein | .237 |
| Nut fat (perfectly emulsified) | .204 | Fat | .276 |
| Digested starch (Maltose, etc.) | .493 | Carbohydrates | .439 |
| Salts | .022 | Ash | .022 |
| | | Fuel value, Calories per pound | 2,600 |

### ACORNS (*Quercus*).

In Bulletin 54 of this Station, Nuts as Food, there were given the results of analyses of acorns from the common black oak of Arizona, *Quercus Emoryi*, and samples of acorn meal and acorn bread used by the Indians of the Yosemite Valley as food. We were indebted to Dr. Chestnut of the Division of Botany, U. S. Department of Agriculture for these samples. In April, 1900, Dr. Chestnut sent us specimens of the "Valley White Acorn," *Quercus lobata*, "one of the acorns which is most abundantly used by the Indians of Mendecino county, California." This is analyzed as number 6312. In shelling the nuts it was found that about half of them were spoiled. The edible portion of good ones made up the sample taken for analysis, but the proportion of shell (refuse) to kernel (edible portion) is based upon all of the acorns, good and poor.

Weight of acorns, 130 grams.
Edible portion, kernels, 93 grams, 71.54 per cent.
Refuse, shells, 37 grams, 28.46 per cent.

The composition is given below together with that of the acorns previously analyzed: It will be noted that the acorns of *Quercus lobata* are much lower in fat content and higher in carbohydrates than the other samples examined. This affects the fuel value markedly, as the fats have much greater heats of combustion than the carbohydrates.

WEIGHT OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF ACORNS, ACORN MEAL, AND ACORN BREAD.

| Laboratory number. | | Refuse. | Water. | Protein. | Fat. | Total carbohydrates. | Ash. | Fuel value per pound. |
|---|---|---|---|---|---|---|---|---|
| 6312 | Acorn, Q. lobata, | Lb. | Lb. | Lb. | Lb. | Lb. | Lb. | Calo. |
| | Edible portion ........ | - | .075 | .052 | .086 | .763 | .024 | 1930 |
| | As purchased.......... | 285 | .054 | .037 | .061 | .546 | .017 | 1380 |
| 6193 | Acorn, Q. Emoryi, | | | | | | | |
| | Edible portion . ...... | - | .041 | .081 | .374 | .480 | .024 | 2720 |
| | As purchased. ........ | .356 | .026 | .052 | .241 | .309 | .016 | 1750 |
| 6184 | Acorn meal . ............ | - | .087 | .057 | .186 | .650 | .020 | 2265 |
| 6185 | Acorn bread ....... ...... | - | .603 | .022 | .099 | .270 | .006 | 2345 |

## Italian Chestnuts.

These nuts were purchased in Boston and were used in digestion experiments. During the process of drying, a few of the nuts moulded, giving an unusually large proportion of bad nuts. Five kilograms gave:

Kernels, 3832 grams, 76.64 per cent.
Shells, 472 grams, 9.45 per cent.
Bad Nuts, 696 grams, 13.91 per cent.

The chemical composition is shown in the following table, to which is added for comparison two analyses of Italian varieties grown in California:

WEIGHT OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF ITALIAN CHESTNUTS.

| | Shells. | Water. | Protein. | Fat. | Carbohydrates. | Ash. | Fuel value. |
|---|---|---|---|---|---|---|---|
| | Lb. | Lb. | Lb. | Lb. | Lb. | Lb. | Calo. |
| Edible portion, | | | | | | | |
| Maine Station, 6393 ......... | - | .449 | .039 | .021 | .477 | .014 | 1075 |
| California grown * ......... | - | .538 | .066 | .020 | .369 | .007 | - |
| California grown * ......... | - | .527 | .041 | .020 | .404 | .008 | - |
| As purchased, | | | | | | | |
| Maine Station, 6393 ......... | .094 | .407 | .035 | .019 | .432 | .013 | 974 |
| California grown .......... | .154 | .455 | .056 | .017 | .312 | .006 | - |
| California grown .......... | .155 | .445 | .035 | .017 | .341 | .007 | - |

* Calif. Experiment Station, Report 1896-7, p. 153.

## Three Tropical Fruits.

The Division of Pomology of the U. S. Department of Agriculture has furnished the Station with specimens of three little used tropical fruits, the cultivation of which is being introduced into the subtropical portion of the United States by the Department of Agriculture. The description of the fruits and the uses to which they are put are furnished by Mr. William Taylor, Pomologist in charge of Field Investigation of the Department.

SURINAM CHERRY,

Sometimes called Pitanga. 6313. This is the ribbed, roundish, oblate fruit of *Eugenia Michelii.* It is a tropical shrub, native to Brazil and other tropical portions of South America, attaining a height of about 20 feet. It is sparingly grown in Southern Florida and Southern California, where the fruits are esteemed for their sharp but pleasant acid flavor. They are somewhat used in domestic jelly-making, but the product has not yet attained commercial recognition,—at least in this country.

The samples analyzed were grown at Rockland Grove, Lemon City, Florida.

Weight of cherries, 140 grams.
Edible portion, 116 grams, 82.86 per cent.
Stems and stones, 24 grams, 17.14 per cent.

WEIGHTS OF NUTRIENTS OF ONE POUND OF SURINAM CHERRIES.

| | Water. | Protein. | Carbohydrates. | Ash. |
|---|---|---|---|---|
| | Lb. | Lb. | Lb. | Lb. |
| In fresh pulp | .850 | .004 | *.139 | .007 |
| Edible in one pound whole fruit | .704 | .003 | .115 | .006 |

* Including invert sugars, .100 pound; total sugars, .101 pound.

AVOCADO,

Also known as Aguacate, Alligator Pear and Mid-Shipman's Butter. 6282.

This interesting fruit,—*Persea gratissima* of botanists—is the product of a tree native in tropical America, but now widely grown throughout tropical countries. The principal commercial supply in the markets of the United States comes from Jamaica, though there is a considerable and increasing production in Southern Florida, both on the mainland and the keys, and a small production in the milder portions of Southern California.

The West Indian type of the species—which is the only one found in our Eastern markets—yields a fruit as large as our largest pears. The varieties differ considerably in form, and range from deep purple to light green in color.

The principal use to which this fruit is put is that of salad making. The soft buttery substance of the fruit lends itself to this use admirably. The Mexican type which is now being tested in both Florida and California, yields a much smaller fruit, but the tree is reputed to endure several degrees of frost, whereas the tree of the West Indian type is injured by a temperature of 32 degrees. The Mexican type is also reported to be of more dwarfish habit than the West Indian, the latter becoming a tree of large proportions.

The specimens analyzed were grown at Cocoanutgrove, Florida. Three pears were received, representing three distinct varieties. The pulp of the pears was mixed and analyzed as one specimen.

Weight of three fruits, 1,021.6 grams.

| | | |
|---|---|---|
| Edible portion, | 762.2 grams, | 71.09 per cent. |
| Seeds, | 201.4 grams, | 19.71 per cent. |
| Skins, | 94.0 grams | 9.20 per cent. |
| | 1,021.6 | 100.00 |

WEIGHTS OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF ALLIGATOR PEAR.

| | Water. | Protein. | Fat. | Carbohydrates. | Ash. | Fuel value per pound. |
|---|---|---|---|---|---|---|
| | Lb. | Lb. | Lb. | Lb. | Lb. | Calo. |
| In one pound of edible portion........ | .811 | .010 | .102 | .068 | .009 | 1758 |
| Edible in one pound of whole fruit.... | .576 | .007 | .073 | .049 | .006 | |

ROSELLE,

Also known as Jamaica sorrel, 6394,—the *Hibiscus Sabdariffa* of botanists—is a widely distributed tropical plant yielding the Roselle fiber of commerce. As grown in Florida and California it is an herbaceous annual. It is valued in both states for its fleshy, acidulous calyces from which jellies and preserves are made that are of a beautiful wine-red color and have a flavor approaching that of the cranberry. The plants are grown from seed planted in the spring and they require a long season free from frost to mature the crop. Under favorable conditions they produce a very heavy, continuous crop of blossoms in the latter part of the summer and autumn. The thick, juicy, dark red calyces are the only portions used, and these are at their best soon after the petals fall. If the harvest is long delayed, the enlarging ovary forms too large a proportion of the product and lessens its value by detracting from the acidulous flavor of the jelly or preserves.

The specimens examined were from Oneco, Manatee Co., Florida. The pod and calyx were analyzed separately. Extracts from both pod and calyx were also analyzed. 125 grams of the pods with the enclosing calyx gave:

| | |
|---|---|
| Pods, 63.1 grams, | 50.48 per cent. |
| Calyx, 61.9 grams, | 49.52 per cent. |

WEIGHTS OF NUTRIENTS AND FUEL VALUE OF ONE POUND OF JAMAICA SORREL.

| | Water. | Protein. | Fat. | Carbohydrates. | Ash. |
|---|---|---|---|---|---|
| | Lb. | Lb. | Lb. | Lb. | Lb. |
| Calyx | .865 | .021 | .003 | .103 | .008 |
| Pod | .840 | .017 | .010 | .122 | .011 |
| Extract from calyx | .912 | .009 | .......... | *.072 | .007 |
| Extract from pods | .937 | .015 | .......... | †.042 | .007 |

* Including sugars, .016 lb. † Including sugars, .010 lb.

## NEWSPAPER BULLETINS PUBLISHED IN 1901.

CHAS. D. WOODS.

Whenever there is matter of importance which we wish to bring promptly to the attention of the people of the State we make as clear and concise a statement as possible in the style and type of a newspaper column and mail it as a "Special Newspaper Bulletin" to all the press of the Station exchange mailing list. These Newspaper Bulletins are quite generally printed by the papers and the Station is under obligations to the press for this opportunity of specially and promptly being put in touch with the people.

During the year the Station has issued several special newspaper bulletins on miscellaneous subjects and 12 monthly meteorological bulletins. The results of the meteorological observations thus reported are summarized beyond. The matter of three of the newspaper bulletins has not appeared in any of the regular bulletins of the Station and is therefore here reprinted as a matter of permanent record.

## THE COLORADO POTATO BEETLE.

*Effects of poisons with and without Bordeaux mixture on badly infested fields.*

In a series of experiments in 1901 it was found that three applications of Paris green at the rate of one-half pound to the acre is sufficient to keep the vines free from the Colorado potato beetle provided the sprayings are made at such times as to have the poison on all the foliage when the bugs first hatch.

Every year many potato growers wait until the vines are well covered with the bugs before beginning to fight them, and then the Station is in receipt of letters of complaint against the quality of the poisons, and requests for analysis. As this condition of eaten vines covered with bugs is ever recurring it was decided to make a test of the effect of different amounts of poison upon the bugs on a badly infested field. Since it was thought the presence of the copper salts in Bordeaux mixture might affect the results the poisons were used both with and without Bordeaux mixture. As no practical remedy other than arsenic has thus far been found for the potato beetle, arsenite of copper (Paris green) and arsenate of lead were used.

The field selected contained 15 to 20 acres. The bugs were very numerous and some of the vines were badly eaten. The poisons were applied with a mechanical 4-rowed sprayer fitted with powerful pump and double Vermorel nozzles. A barrel of each mixture was so applied as to cover a little more than one acre. The Paris green was applied at the rate of ½, 1, 2 and 3 pounds per barrel of 50 gallons both with and without Bordeaux mixture. The Arsenate of lead was applied at the rate of 1, 2 and 3 pounds per barrel both with and without Bordeaux mixture.

Where Paris green was used with the Bordeaux mixture lime was added at the rate of 3 lbs. to the barrel in order to prevent the burning of the foliage. While arsenate of lead does not burn the foliage, the lime was applied with it in order that the methods of application of the poisons should be comparable.

Because the center of the field was more badly infested than either end, the spraying was begun with both Paris green and Arsenate of lead from the center. Plot "A" was at the extreme north of the field and plot "O" was at the extreme south. In reporting below there are arranged in accordance with the kinds and amounts of poisons used rather than in the arrangement in the field.

The poisons were applied in the morning of Tuesday, July 9. Late in the afternoon of July 10th, there was a heavy shower. The observations were made early Friday morning, July 12th. The arrangement and treatment of plots follow:

(F). ½ lb. Paris green; 3 lbs. lime. A good many bugs still left on some plants. Some badly eaten plants cleaned from bugs; other still badly infested.

(G). 1 lb. Paris green; 3 lbs. lime. Some bugs still left. An occasional plant badly infested. Cleaner than F.

(H). 2 lbs. Paris green; 3 lbs. lime. No cleaner than G.

(I). 3 lbs. Paris green; 3 lbs. lime. Quite free from bugs. Only a few on occasional plants.

(K). ½ lb. Paris green; Bordeaux mixture. Very few bugs.

(L). 1 lb. Paris green. Bordeaux mixture. Much the same as K.

(M). 2 lbs. Paris green; Bordeaux mixture. Not quite as clean as L and K.

(N). 3 lbs. Paris green; Bordeaux mixture. Not as clean as M, L, or K.

(E). (This plot lies next to F in the field). 1 lb. arsenate of lead; 3 lbs. lime. Quite clean.

(D). 2 lbs. arsenate of lead; 3 lbs. lime. Rather better than E.

(C). 3 lbs. arsenate of lead; 3 lbs. lime. Not as clean as D or E.

(B). 1 lb. arsenate of lead; Bordeaux mixture. Better than C. About the same as E.

(A). 2 lbs. arsenate of lead; Bordeaux mixture. Very clean; about the same as D.

(O). (In the field, this plot lies next to N). 3 lbs. arsenate of lead; Bordeaux mixture. Very clean; much cleaner than K, L, M or N.

From the above it is seen that Paris green with Bordeaux mixture was more effective than Paris green without the Bordeaux. It was expected that the result would be otherwise, as in other cases the bugs seemed to dislike and avoid the copper salts as far as possible. It is probable that Wednesday's shower washed off the Paris green when applied with white wash (lime) but did not affect it as much when it was applied with Bordeaux mixture.

The arsenate of lead seemed to kill equally as well whether applied with lime or with the Bordeaux mixture. This can probably be explained by the fact that arsenate of lead when once dried is with difficulty washed from the foliage. The arsenate of lead killed better than did the Paris green. This may be explained by the washing off by the shower of the Paris green both with and without Bordeaux mixture.

One-half pound of Paris green or 1 pound of arsenate of lead applied with the Bordeaux mixture was effective in cleaning the badly infested field from the great majority of the bugs. When plants are making as rapid growth as were these potatoes (each stem growing about an inch a day), it is impossible with one application to entirely free them from bugs, because there will always be new leaves for the bugs to crawl onto and feed upon.

In the opinion of the writer, in order to kill potato bugs with poisons, there are two important things to be observed. First, the poison must be as evenly distributed as possible over the entire plant; and in the case of infested fields, the first application must be followed in one or two days by a second application in order to kill the bugs on the new foliage.

## Feeding Stuffs Inspection Law.

*Another instance of low grade cotton seed meal excluded from Maine markets.*

The best laws are those which operate so quietly that the public is likely to doubt their necessity or even to forget their existence. It is only occasionally that an open and conspicuous violation of our statutes calls for their full and prompt enforcement and satisfactorily demonstrates their effectiveness.

Since the enactment of the law regulating the sale of concentrated commercial feeding stuffs, it has occasionally, but decreasingly, been said that the law is of no value. In the publications of the Station the opposite of this position has been taken, and evidence has from time to time been submitted to prove the value of the law and the wisdom of the legislature that enacted it. A recent instance of its working, in ways not generally appreciated, is of interest and importance since it indicates also a desire on the part of the large handlers of feeding stuffs to conform to the law and to give their customers high grade goods.

It has been many months since the Station has received a sample of low grade cottonseed meal, either from correspondents or through its inspectors; but a week ago a sample of bright cottonseed meal of good color and mechanical condition was received from one of the largest jobbing houses in the State with the request that it be analyzed. Accordingly the protein and fat were determined and the following letter written:

"The sample of cottonseed meal which you sent us carries 22.44 per cent. protein and 6.48 per cent. fat. There is apparently some coloring matter added to conceal the cotton hulls which are ground with the sample. After extracting with ether, which we do in estimating the fat, the meal instead of being yellow, like the original sample, is nearly black.

"This is the poorest cottonseed that we have seen in this State for a good many months. I trust that you are not intending to offer it for sale at any price. I should be pleased to know the history of the sample. There is no charge for the analysis."

The reply received was as follows:

"Yours of September 18th received. The cottonseed meal was sent to us by a New York party who wished us to handle the product of the mill. We requested, for the first thing we did, to send us the analysis of it which they failed to do, but they still kept trying to make arrangements with us to handle their meal. We at last requested them to send us a large sample, which we immediately sent you for analysis and now that we have found it so poor, we certainly shall not handle any of it, and shall make sure that none of our competitors do.

"We do not handle any meal that runs less than 43 per cent. protein, and we intend to and try to buy all the meal that we can that contains a higher per cent."

The law has resulted in the education of the dealer so that he has knowledge of the feeding value of the goods he handles. While as a whole, feed dealers have always been anxious to give full value in the goods they sell, the feeding stuffs law enables them to know the quality of the materials they handle, not only from their appearance but from their chemical composition.

As soon as the winter stock of feeding stuffs are in the market, the Station representatives will draw samples for analysis. The results cannot be published and ready for distribution until January or February. In the meantime if the feeders desire to know the quality of the goods they are using, or dealers what they are selling, a two ounce sample sent to the Station (preferably in tin or glass) will be promptly analyzed and the results reported to the correspondent without cost to the sender. Such co-operation will materially add to the effectiveness of the law.

## The Chinch Bug.

*Damage in western Maine. Description and remedies.*

The chinch bug is a blackish insect, from one-eighth to one-sixth of an inch long, and about one-twentieth of an inch broad. When disturbed it emits a characteristic "stinkbug" odor. Two forms may be distinguished according to the length of the wings, which are white and thin, almost like tissue paper. The long winged form has wings covering the whole of the abdomen or back and colored at the center of each outer edge by a black diamond shaped spot. The short winged form has wings reaching only about half the length of the abdomen and looking like a short, whitish letter X laid on the middle of the back. Both of these forms hide during the winter in favorable places, and during warm weather in spring, probably the latter part of May or early June, make their way to places suitable for laying their eggs. These are whitish in color, about the size of the eye of a fine needle, and are laid among the roots and bases of the stems of grass and grain. Each female bug may lay during two or three weeks from 300 to 500 eggs. These hatch out in about two weeks and the young reach maturity about four weeks later, working in the meantime about the roots of the grass. The older larvae and the adults work usually on the stems of the plants, sucking the sap and thus causing the plants to wither and finally to die.

Complaints received at the Experiment Station during the summer indicated that the chinch bugs were doing considerable damage to the grass crop in western Maine. An examination by the assistant zoologist of the station into the conditions existing in the town of Fryeburg during the latter part of September showed that the chief injury was to timothy and hungarian grass, although corn and oats were in some instances attacked, as was also witch grass and barn grass. Timothy was completely killed over areas varying in size from a few square yards to others of several acres. In some instances clover and witch grass had grown up in these spots. Barn grass growing among corn was completely killed and witch grass was killed to the ground, but grew up again as the bugs passed outward.

Although the damage for this year had ceased, the bugs were easily found; in one case clustering in large numbers under the dead leaves, stems and other debris among the clover immediately bordering a spot on which the timothy had been killed; in another case crowding among and about the clumps of beard grass and sedge grass bordering a strip of hungarian grass. In such places as these and under dead grass and weeds about fence corners and fields; under manure spread in the fall and not plowed under; in masses of dead leaves, bark or brush heaps, and rubbish of all sorts, the bugs pass the late fall and winter months, lying apparently dead during cold weather, but quickly coming into activity during the warm days of late spring.

As the amount of injury next year will depend largely on the number of bugs which winter over safely, it is important that pains be taken to destroy as many as possible before the ground is covered with snow. The following methods are probably the best for the State of Maine.

1st. Burning. Where there is considerable clover mixed with the hungarian or timothy, the bugs are very likely to winter over beneath the clover which borders for a few feet or yards immediately upon the spot where they have stopped injuring the grass. If such a strip be mowed closely by hand and allowed to dry for a few days it may be burned over and quantities of the bugs will be killed. If this burning be done after the ground has frozen, little, if any, injury will be done to the crop. All rubbish such as dried grass and weeds along the edges of fields, brush heaps, dead leaves, bark and chips, clumps of wild grasses, sedge grasses etc., in near by fields should be burned as completely as possible.

2d. Spraying. Chinch bugs are quickly killed by kerosene or kerosene emulsion, but it is essential that it be thoroughly applied. The bugs are so protected by the clover and grass that it is almost impossible to reach them by ordinary spraying. Sprinkling freely over the infested spots will usually be effectual but will probably kill the grass also. Clumps of sedge or wild grass in which careful examination shows the bugs to be abundant might be sprinkled thoroughly with kerosene and then burned, thus killing bugs which had crowded deep down among the bases of the plants, where the flames alone might not reach them.

3d. Plowing. Where bugs are found in considerable numbers at the edges of spots which they have eaten over, they may be destroyed by plowing under the strip in which they are hiding. Deep plowing, however, is necessary, followed by dragging and rolling in order to completely cover under all vegetation and close up all holes or passages through which the bugs might make their way to the surface.

If used promptly and thoroughly, these methods are also applicable when the bugs are found to be working during early summer and are all the more effective because the bugs do not scatter over the whole field but stay together in comparatively small areas or strips, and if they are promptly killed over such patches further injury for the season will be very much lessened.

## ACKNOWLEDGMENTS.

Acknowledgment is hereby made for the following gifts to the Station during 1901:

Seeds, plants, cuttings and samples of food materials.—United States Department of Agriculture.

Cuttings and Seeds.—Cornell University, Ithaca, N. Y.

Nitrate of soda.—Propaganda for the Use of Nitrate of Soda, New York City.

Sulphate, Carbonate and Muriate of Potash and Kainit.—German Kali Works, New York City.

Disparene, Bodo, Dry Bordeaux Mixture and Creosote Emulsion.—Bowker Chemical Company, Boston.

Dog Bane, dry for an insecticide.—Comisión de Parasitología Agrícola, City of Mexico, Mexico.

Aroostook Power Sprayer for Potatoes.—Field Force Pump Company, Lockport, N. Y.

Orchard Lamp for moths.—A. F. Severance, Nobleboro, Maine.

Lincoln Dip and Lincoln Disenfectant.—Pasteur Vaccine Company, Chicago.

Cyphers Anti Fly Pest—Cyphers Incubator Company, New York City.

Alderney Butter Color—Heller and Merz Co., New York City.

Sugar Feed—Conover & Co., Minneapolis, Minn.

Peep O'Day Brooder—E. F. Hodgson, Dover, Mass.

Brooder—Cyphers Incubator Company, New York City.

The Station receives in exchange for its bulletins and reports, the official agricultural publications of American Experiment Stations and State and National Departments of Agriculture, Horticulture and Dairying and those of Australia, Brazil, Canada, Chili and other foreign countries. Many private institutions, both at home and abroad, which issue publications bearing upon agricultural subjects, kindly send them to the Station Library.

In addition to the above, the following newspapers and other publications are kindly donated to the Station by the publishers:

Agricultural Epitomist, Indianapolis, Ind.
Agricultural Experiments, Minneapolis, Minn.
Agricultural Advertising, Chicago, Ill.
Agricultural Gazette, Sidney, New South Wales.
Agricultural Journal, Maritzburg, Natal.
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.
Breeder's Journal, Himrods, N. Y.
Boletem de Agricultura, San Paulo, Brazil.
Canadian Horticulturist, Grimsby, Ont.
Chronique Agricole, Lausanne, Switzerland.
Country Gentleman, Albany, New York.
Dairy World, Chicago, Ill.
Detroit Free Press, Detroit, Mich.
Dietetic and Hygienic Gazette, New York City.
Elgin Dairy Report, Elgin, Ill.
Farmers Advocate, London, Ont.
Farmer's Guide, Huntington, Ind.
Farmer's Tribune, Des Moines, Iowa.
Farm News, Springfield, O.
Farm Home, Springfield, Ill.
Farm Journal, Philadelphia, Pa.
Farm-Poultry, Boston, Mass.
Farmer's Review, Chicago, Ill.
Farmer's Voice, Chicago, Ill.
Florist's Exchange, New York City.
Florist's Review, Chicago, Ill.
Forester, Princeton, N. J.
Flour and Feed, Waukegan, Ill.
Garden and Farm, Chicago, Ill.
Golden Egg, St. Louis, Mo.
Green's Fruit Grower, Rochester, N. Y.

Hoard's Dairyman, Fort Atkinson, Wis.
Herd Register, Peterborough, N. H.
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 Department of Agriculture, Perth, Western Australia.
Leader and Farm Journal, Fort Fairfield, Me.
Live Stock Journal, Chicago, Ill.
La Grele Station Viticole de Villefranche. (Rhone) France.
La Laiterie Belge, Enghein, Belgium.
Louisiana Planter, New Orleans, La.
Lewiston Weekly Journal, Lewiston, Maine.
Maine Farmer, Augusta, Me.
Massachusetts Ploughman, Boston, Mass.
Milk News, Chicago, Ill.
Mirror and Farmer, Manchester, N. H.
Modern Miller, St. Louis, Mo.
National Farmer and Stock Grower, National Stock Yards, Ill.
National Stockman & Farmer, Pittsburg, Pa.
New England Farmer, 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.
Northwestern Miller, Minneapolis, Minn.
Ohio Farmer, Cleveland, O.
Operative Miller, Chicago, Ill.
Oregon Agriculturist, Portland, Oregon.
Park & Cemetery, Chicago, Ill.
Practical Farmer, Philadelphia, Pa.
Practical Fruit Grower, Springfield, Mo.
Progressive Farmer, Newport, Vt.
Public Ledger, Philadelphia, Pa.
Reliable Poultry Journal, Quincy, Ill.
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.
Strawberry Specialist, Kittrell, N. C.
Sugar Beet, Philadelphia, Pa.
Turf, Farm & Home, Waterville, Me.
Up-to-Date, Indianapolis, Ind.
Vick's Magazine, Rochester, N. Y.
Weekly Union, Manchester, N. H.
Western Fruit Grower, St. Joseph, Mo.
West Virginia Farm Review, Charleston, West Va.
The World, Vancouver, B. C.

# METEOROLOGICAL OBSERVATIONS.

Lat. 44° 54′ 2″ N. Lon. 68° 40′ 11″ W. Elevation 150 feet.

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-three years.

The winter of 1900-1 was remarkable for the early snow that fell on unfrozen ground and later accumulated to an unusual extent. The total fall, however, was only about five-sixths of the average, and the large amount on the ground at one time was due to the lack of the usual winter thaws. The absence of the frost in the ground not only assisted in the rapid disappearance of the snow in the spring, but allowed the water from the melting snow and ice to enter the ground instead of escaping into the streams. The spring rains were excessive, and had the ground been in its usual condition the damage from floods, though serious in some localities, would have been much greater.

The following notes are intended to apply to this particular locality. The year has been characterized by the unusual distribution of rain and snow. The average precipitation for April at this Station, as shown by thirty-three years' observation, is 2.9 inches, lower than that for any other month of the year. The fall on April last was nearly double this amount, 5.12 inches, the largest thus far recorded at Orono for this month. Reference to the table on page 191 shows that these conditions were general through a large part of the State. During May, June and July the aggregate fall was four inches below the normal, and crops in some sections suffered severely. The usual heavy rains of November were lacking, and the deep snow that fell on November 14 found but little water in the ground and many low wells, conditions which were relieved by the thaw and rains of December 14 and 15. The total precipitation for December, (rain and melted snow) was 7.94 inches, double the usual amount. Extreme temperatures were noted in July, the thermometer on July 16 rising to 100°, dropping to 40° on the morning of July 25, a range of 60° in nine days.

# METEOROLOGICAL SUMMARY FOR 1901.
## Observations Made at the Maine Experiment Station.

| | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Mean. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Highest barometer | 30.43 | 29.89 | 30.31 | 30.30 | 30.12 | 30.07 | 30.06 | 30.15 | 30.27 | 30.42 | 30.20 | 30.35 | 30 22 | ...... |
| Lowest barometer | 28.77 | 29.02 | 29.13 | 29.47 | 29.37 | 29.52 | 29.55 | 29.61 | 29.46 | 29.12 | 28.91 | 29.08 | 29.25 | ...... |
| Mean barometer | 29.81 | 29.44 | 29.71 | 29.90 | 29.73 | 29.76 | 29.76 | 29.88 | 29.85 | 29.87 | 29.71 | 29.83 | 29.17 | ..... |
| Highest temperature | 42°.0 | 40°.0 | 49°.0 | 76°.0 | 85°.0 | 91°.0 | 100°.0 | 86°.0 | 89°.0 | 71°.0 | 58°.0 | 55°.0 | ........ | ..... |
| Lowest temperature | —20°.0 | —18°.0 | —13°.0 | 25°.0 | 32°.0 | 38°.0 | 40°.0 | 43°.0 | 28°.0 | 20°.0 | —8°.0 | —17°.0 | ........ | ...... |
| Mean temperature | 15°.03 | 14°.20 | 27°.74 | 44°.73 | 53°.90 | 63°.80 | 68°.60 | 66°.65 | 59°.50 | 47°.64 | 29°.10 | 23°.29 | 42.81 | ...... |
| Mean temperature for 33 years | 16°.01 | 19°.13 | 27°.54 | 40°.54 | 52°.34 | 62°.09 | 67°.10 | 65°.13 | 57°.17 | 46°.05 | 34°.17 | 20°.73 | 42.33 | ...... |
| Total precipitation in inches | 4.33 | 1.95 | 5.46 | 5.12 | 2.07 | 1.79 | 2.75 | 3.76 | 4.22 | 4.12 | 2.54 | 7.94 | .... ... | 46.05 |
| Mean precipitation for 33 years | 4.36 | 4.07 | 4.29 | 2.90 | 3.58 | 3.55 | 3.31 | 3.57 | 3.39 | 4.07 | 4.37 | 3.84 | ........ | 45.30 |
| No. of days with precip. of .01 in. or more | 12 | 5 | 11 | 9 | 13 | 9 | 11 | 8 | 8 | 8 | 9 | 12 | ........ | 115 |
| Snow fall in inches | 25.5 | 19.5 | 11.7 | ... .... | ........ | ........ | .... ... | ....... | ........ | trace | 19.8 | 21.5 | ........ | 98.0 |
| Average snow fall for 33 years | 23.3 | 21.6 | 16.9 | 5.6 | ....... | ........ | ........ | ........ | ....... | .9 | 8.2 | 16.9 | .... ... | 93.4 |
| Number of clear days | 10 | 12 | 12 | 10 | 7 | 12 | 11 | 13 | 13 | 11 | 7 | 11 | ... ... | 129 |
| Number of fair days | 6 | 6 | 1 | 0 | 8 | 7 | 5 | 6 | 7 | 10 | 6 | 4 | ....... | 66 |
| Number of cloudy days | 15 | 10 | 18 | 20 | 16 | 11 | 15 | 12 | 10 | 10 | 17 | 16 | ........ | 160 |
| Total movement of wind in miles | 5767 | 7356 | 6214 | 5936 | 6253 | 4868 | 4440 | 4936 | 5315 | 5483 | 5005 | 6007 | ... .... | ...... |

## Monthly and Annual Precipitation (as rain) for the Year 1901.

| | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Annual. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bar Harbor | 4.83 | 1.63 | 10.30 | 5.81 | 2.74 | 3.23 | 1.63 | 3.00 | 3.28 | 3.45 | 3.50 | 9.78 | 53.18 |
| Belfast | 4.51 | 2.16 | 7.80 | 6.49 | 2.09 | .88 | 3.10 | 3.64 | 2.50 | 3.53 | 3.11 | 9.74 | 49.55 |
| Bemis | 3.60 | 1.20 | 5.90 | 7.14 | ....... | 1.66 | 5.46 | 2.28 | 1.87 | 2.75 | 3.70 | 2.20 | 37.76 |
| Carmel | 6.67 | 1.90 | 3.75 | 4.92 | 2.95 | 1.95 | 3.00 | 2.91 | 3.58 | 3.56 | 2.40 | ....... | 37.59 |
| Cornish | 3.03 | 1.26 | 5.70 | 11.52 | 8.40 | 1.79 | 6.25 | 9.00 | 3.06 | 3.47 | 2.00 | 7.52 | 63.00 |
| Eastport | 4.80 | 1.65 | 4.88 | 5.58 | 3.29 | 5.45 | .91 | 2.48 | 2.92 | 1.72 | 1.91 | 6.02 | 41.61 |
| Fairfield | 2.74 | 1.95 | 5.22 | 3.96 | 2.35 | 1.64 | 2.99 | 3.39 | 3.79 | 2.77 | 2.19 | 7.98 | 40.97 |
| Farmington | 3.27 | 1.04 | 4.54 | 6.88 | 3.95 | 3.47 | 4.22 | 3.45 | 2.25 | 3.03 | 2.10 | 8.97 | 47.17 |
| Flagstaff | 2.20 | 1.50 | 2.75 | 7.83 | 2.34 | 4.58 | 5.01 | 4.95 | 1.65 | 2.40 | 2.20 | 4.88 | 42.29 |
| Gardiner | 3.78 | 1.76 | 6.25 | 6.43 | 3.92 | 1.36 | 4.26 | 5.54 | 2.08 | 4.18 | 2.41 | 9.43 | 51.30 |
| Kineo | 2.65 | 1.80 | 1.45 | 4.85 | .75 | 6.55 | 1.95 | 2.55 | .94 | 2.26 | 2.70 | 7.40 | 35 85 |
| Lewiston | 3.19 | 1.15 | 5.14 | 8.16 | 5.77 | 1.12 | 4.25 | 4.75 | 1.75 | 3.33 | 2.20 | 7.59 | 48.40 |
| Mayfield | 2.60 | 1.20 | 5.55 | 6.33 | 2.26 | 2.94 | 5.40 | 5.25 | 2.63 | 3.43 | 2.44 | 8.63 | 48.64 |
| North Bridgton | ... ... | 1.70 | 4.80 | 7.60 | 7.56 | 3.91 | 5.13 | 5.46 | 2.55 | 3.24 | 2.14 | 5.75 | 49.84 |
| Orono | 4.33 | 1.95 | 5.46 | 5.12 | 2.07 | 1.79 | 2.75 | 3.76 | 4.22 | 4.12 | 2.54 | 7.94 | 46.04 |
| Portland | 3.34 | 1.68 | 6.43 | 7.47 | 7.17 | .93 | 4.21 | 3.26 | 2.18 | 3.12 | 1.89 | 7.14 | 48.82 |
| Rumford Falls | 2.77 | .74 | 4.05 | 7.91 | 6.54 | 3.84 | 4.91 | 3.47 | 2.59 | 3.48 | 1.76 | 5.53 | 47.59 |

With the exception of readings from the Orono station, the above table is compiled from the monthly bulletins of the U. S. Weather Bureau.

# REPORT OF THE TREASURER.

Maine Agricultural Experiment Station in account with the United States appropriation, 1900-1901.

DR.

| | | |
|---|---|---|
| To receipts from the Treasurer of the United States as per appropriation for the fiscal year ending June 30, 1901, as per act of Congress approved March 2, 1887 | | $15,000 00 |

CR.

| | | |
|---|---|---|
| By salaries: | | |
| (a) Director and administration officers | $2,451 24 | |
| (b) Scientific staff | 4,044 49 | |
| (c) Assistants to scientific staff | 1,373 94 | |
| (d) Special and temporary services | 32 67 | |
| Total | | 7,902 3 |
| Labor: | | |
| (a) Monthly employees | $751 13 | |
| (b) Daily employees | 943 85 | |
| (c) Hourly employees | 61 77 | |
| Total | | 1,756 75 |
| Publications | | 286 77 |
| Postage and stationery | | 275 01 |
| Freight and express | | 219 48 |
| Heat, light and water | | 801 54 |
| Chemical supplies: | | |
| (a) Chemicals | 297 21 | |
| (b) Other supplies | 144 21 | |
| Total | | 441 42 |
| Seeds, plants and sundry supplies: | | |
| (a) Agricultural | $106 42 | |
| (b) Horticultural | 130 28 | |
| (c) Botanical | 2 96 | |
| (e) Miscellaneous | 158 74 | |
| Total | | 398 40 |
| Fertilizers | | 128 33 |
| Feeding stuffs | | 991 27 |
| Library | | 141 15 |
| Tools, implements and machinery | | 160 48 |
| Furniture and fixtures | | 99 08 |
| Scientific apparatus | | 291 83 |

| | | |
|---|---|---|
| Live stock: | | |
| (a) Horses | $75 00 | |
| (b) Cattle | 127 50 | |
| (e) Poultry | 14 70 | |
| (f) Sundries | 228 83 | |
| Total | | 446 03 |
| Traveling expenses | | $289 23 |
| Buildings and repairs | | 370 89 |
| 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, 1901, 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 "General Account" for the year ending June 30, 1901.

DR.

| | | |
|---|---|---|
| To balance from 1900-1901 | $636 00 | |
| Sales of produce, etc | 2,714 36 | $3,350 36 |

CR.

| | | |
|---|---|---|
| By labor | $967 07 | |
| Feeding stuffs | 288 04 | |
| Contingent (chiefly insurance and water supply construction) | 872 20 | |
| Buildings and repairs | 730 00 | |
| Balance to 1900-1901 account | 493 05 | $3,350 36 |

---

Maine Agricultural Experiment Station in account with Creamery Inspection for the year ending December 31, 1901.

DR.

| | |
|---|---|
| To fees for calibrating glassware | $84 65 |

CR.

| | |
|---|---|
| By expense calibrating glassware | $84 6 |

Maine Agricultural Experiment Station in account with Fertilizer Inspection or the year ending December 31, 1901.

DR.

| | | |
|---|---|---|
| To balance from account of 1900 | $247 37 | |
| Receipts for licenses | 2,720 00 | |
| | | $2,967 37 |

CR.

| | | |
|---|---|---|
| By collection and analyses of samples | $2,141 05 | |
| Executive and office expenses | 700 00 | |
| Balance to account of 1902 | 126 32 | |
| | | $2,967 37 |

---

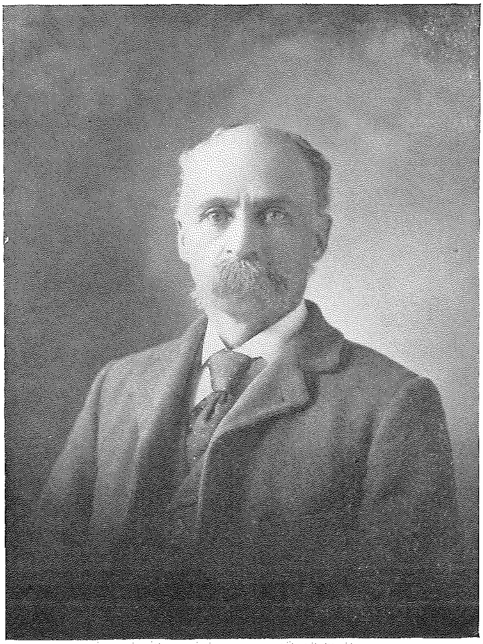
Maine Agricultural Experiment Station in account with Feed Inspection for the year ending December 31, 1901.

DR.

| | | |
|---|---|---|
| To receipts for inspection tags, 1901 | $1,408 60 | |
| Balance to account of 1902 | 834 54 | |
| | | $2,243 14 |

CR.

| | | |
|---|---|---|
| By balance carried from 1900 account | $666 53 | |
| Collection and analyses of samples | 553 71 | |
| Tags | 298 74 | |
| Executive and office expenses | 700 00 | |
| Interest | 24 16 | |
| | | $2,243 14 |



JOHN W. TRUE, NEW GLOUCESTER.

See page 108.

# APPENDIX.

Annual Report of the State Pomological Society

1901—1902.

## CONTENTS.

# SECRETARY'S REPORT.

## PAN-AMERICAN EXHIBIT.

The year has been a very busy one for the Pomological society and an unusually large amount of work has been accomplished. It will be remembered that at our winter meeting in Norway Charles S. Pope was instructed to secure contributions of fruit for the purpose of making an exhibition of fruit at Buffalo. Two hundred and fifty dollars was appropriated by the executive committee later on and the same amount was granted by the Legislature. At the Brooks meeting the secretary was instructed to install the exhibition of fruit at Buffalo, but the sickness of his partner prevented his attending to this work, and arrangements were made with Prof. Munson to look after this work. The secretary visited Buffalo the first of June and had the judge's examination made, giving special prominence to the excellent keeping and market qualities of our fruit. Prof. Munson in his article on "Maine Fruit at the Pan-American Exposition," gives a full report of the society's proceedings and the excellent results secured by the exhibition. It is of interest here to note that without a dissenting voice the legislature granted the society $250 to aid in carrying on this work, while it defeated every attempt to secure aid for other exhibition purposes. The secretary congratulates the society on this mark of confidence on the part of our law makers.

## THE AWARDS AT BUFFALO.

It is a matter of congratulation that the Maine fruit shown by Prof. Munson at the meeting of the American Pomological society held at Buffalo was awarded a bronze medal. As few of these were awarded the fact is deemed worthy of this public mention.

Mr. H. E. Van Deman, judge of fruits at the Pan-American advises the secretary as follows:

"You have two gold medals, one silver medal, twelve bronze medals, three honorable mention as awards for the products shown at the Pan-American Exposition."

### AWARDS AT THE PARIS EXPOSITION.

In this connection it is a pleasure to call attention to the awards made to Maine fruit at the Paris Exposition in 1900. Early in June I received a letter from the U. S. Commission to the Paris Exposition, to the effect that the Maine State Pomological Society was awarded a "Diploma of Silver Medal" and G. B. Brackett, pomologist, writes, "This is understood to be the final official equivalent of the awards to your society on fresh fruits, exhibited in the several temporary competitions in horticulture held during the course of the exposition and reported to you from time to time as announced by the class jury. It is expected that the diploma will be forwarded by the exposition authorities in due time through the United States commissioner general. Please accept our hearty congratulations on the successful outcome of your fresh fruit exhibit. We also extend our sincere thanks for your co-operation in the preparation of our general fruit exhibit at Paris. The United States received a larger number of awards in this class than any other foreign country, a result largely due to the hearty co-operation of fruit growers in the important producing sections. A 'diploma of gold medal' was awarded to Prof. W. M. Munson as collaborator in the general fruit exhibit of the division of pomology, to which a 'grand prize' was awarded. Prof. Munson was instrumental in securing this exhibit while he was president of the society, and the tribute paid to him was well deserved and a compliment to the pomological society."

### PUBLIC MEETINGS, ETC.

At the January meeting of the executive committee the following outline of work was presented to cover the year: A Spring meeting, two horticultural classes, a small fruit meeting and the usual annual meeting and exhibition.

The spring meeting was held in Brooks, Friday, March 22. The day preceding the meeting was very rainy, and in consequence the traveling was soft and unfavorable for a large attendance. As it was the morning session was omitted, but the afternoon and evening sessions were well attended and much enjoyed. The exhibition of fruit although not large, was very good and bore evidence of favorable fruit conditions in this part of the State.

As circumstances did not seem favorable horticultural classes were not organized, though I am confident that such efforts would be appreciated by the public. I hope to see something of the sort brought about another year.

The small fruit meeting was held in Rockland, August 1. A good program was presented, after being well advertised, but the attendance and exhibition were not as large as was anticipated. The desirability of holding meetings of this sort is apparent, for only in this way can fresh fruits be offered as object lessons of tillage, flavor and quality of fruit.

Early in the season an invitation came from the grange at Dexter to hold the annual meeting and exhibition of the society in that thriving town. After careful consideration the executive committee accepted the invitation, and all our efforts were directed toward this meeting. A local committee, consisting of A. A. Eastman, Geo. C. Furber, L. W. Jose, F. O. Additon and W. H. Curtis, was chosen to make all necessary local arrangements and to co-operate with the officers of our society. The committee was active throughout and at every point rendered the most valuable service, for which we wish to make this personal acknowledgment. The meeting itself proved to be one of the strongest and most enthusiastic ever held by the society, and reference is here made to the excellent practical papers and discussions there offered to Maine fruit growers. It was enthusiastic from first to last, and was widely reported in the papers of the State. The music was excellent, and the cordiality of the Dexter people seemed to be unlimited.

The exhibit occupied four tables the entire length of the hall, while cross tables in the rear were occupied by the canned goods and pears, and tables across the front were given up to the flowers, and the stage was decorated with well grown plants from the greenhouse of Mr. Chas. H. Hayden of Dexter.

Of the apple exhibit in general it may be said that it was just fine, the fruit being large in size, high colored and very attractive. At every available moment there were crowds around the tables, and all seemed interested in examining the beautiful display of fruit. The fruit shown by the Experiment Station was much admired, and contained more or less varieties not generally grown in the State. Several of these were Russian varieties, which thrive well at Orono. By courtesy of Mr. H. E. Van Deman some fine specimens of Missouri Ben Davis, York Imperial, Sultan Beauty and Rome Beauty were shown from the Pan-American Exposition. A plate of apples grown by C. D. Tolman, East Dixfield, was shown with the name given by the exporter, who last year sent this variety to Liverpool as the N. Y. Pippin, where it sold for twenty-seven shillings, the highest price received for any Maine fruit sold in that market last year. There were also some fine specimens of the Arctic shown by Mr. O. K. Gerrish of Lakeville, Mass. Among the pears shown by Mr. S. H. Dawes of Harrison was a very good plate of the Idaho. Prof. Powell found many varieties with which he was not familiar, especially several of Maine origin. Selections of these were made and forwarded to the department at Washington, and his report on the merits of the fruit will be awaited with interest.

During the afternoon session of the second day the secretary suggested the propriety of sending a barrel of Maine apples to President Roosevelt. At the close of the meeting a barrel of the choicest fruit was selected, neatly packed and sent forward to the White House with the compliments and best wishes of the society. Shortly after a letter was received, acknowledging the arrival of the fruit, and expressing the thanks of the President for this delicious Maine fruit.

## MAINE FRUIT IN 1900 AND 1901.

The fruit of 1900 so far as it was placed in the market this year brought good prices. The last shipment to Europe was made from Skowhegan—300 barrels of Ben Davis, which netted the grower $900. The panic in prices in the fall which caused so many to sell at nominal figures led our executive committee to ask President Gilbert to ascertain and publish the actual condition of the crop of 1901. His bulletin has been published. Buyers in Maine this year sent parties out to estimate the quantity of fruit in certain orchards and based on this estimate offers were made for the lot. In one case the buyer offered $200 for a lot and the owner declined to sell at that price. He paid out then for harvesting $83 and the same man paid him $500. He thought he sold too soon, and so did I, for 75 barrels of the lot were Kings. Some are still holding their fruit, and it remains to be seen what the price will be. It was not the purpose of the bulletin to tell people when to sell or what they should ask for their fruit; it was rather to advise the fruit growers of the quantity and condition of the crop, leaving them to draw their own conclusions.

Of the crop of 1901 in Maine the early estimates were nearly all wrong. The early indications were unfavorable, as the blossom was irregular and occurred during cold, damp weather—too cold for the bees to work, and there were more or less showers. The season was favorable later on and as the fruit matured every one was surprised at the size of the crop, which was much larger than anticipated and of excellent quality. Apples were never better in Maine than this year, and the buyers from out the State are enthusiastic over the Maine apple, and one of these buyers has purchased a Maine orchard. One farmer tried in vain last year to sell his farm for $500, and this year he harvested 250 barrels of choice fruit. Another man a few years ago had the courage to buy a farm for a thousand dollars. His friends thought he could never pay for it, but this year he had 300 barrels of fruit. Another young man owned half of the old farm on which he was born and gave his brother $1500 for the other half. He gathered 600 barrels of as fine apples as ever grew, most of which are in cold storage at this time. These instances teach their own lessons, and there are many more that have come to my knowledge.

Our Buffalo exhibit called the attention of buyers to Maine fruit, and they have come in from all quarters. So great has been the American demand that foreign buyers have not found people so ready to send their fruit abroad. But the result of this is that a large part of the fruit has already been sold at satisfactory prices, while those who are holding their fruit are expecting still better prices. Nor is this all, cider apples and apples for canning have also found a good market. Estimates of the crop place it from 250,000 to 300,000 barrels—probably about 300,000.

Attention is especially called to the papers and discussions presented at our several meetings. They bear upon nearly every feature of practical fruit culture and I bespeak for them the most careful reading and study.

D. H. KNOWLTON.

## 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. M..........Lewiston
Boardman, Samuel L.............Bangor
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
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............ Gardiner
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
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
Litchfield, Mrs. L. K.............Winthrop
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
Munson, W. M............................Orono
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, 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
J. A. Roberts........... . .......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
A. C. Day ........... ........ South Turner
J. W. Dudley....................Castle Hill
S. L. Merchant ............ ....Winthrop
L. P. Toothaker .......Simpson's Corner
E. Tarr ..........................Mapleton

## ANNUAL MEMBERS, 1901.

Austin, Alfred...................Parkman
Austin, Chas......... ....South Berwick
Beal, Mrs. Altana........North Fairfield
Clark, Chas. H ............ Wells Branch
Copeland, Llewellyn..............Dexter
Davis, Fred......... ............Newport
Day, A. C ....... ...........South Turner
DeCoster, V. P............. .... Buckfield
DeCoster, Mrs. V. P.... .......Buckfield
Dudley, John W................Mapleton
Dunn, A. L... ... ....... ......Buckfield
Eastman, A. A. ... .... ..........Dexter
Edwards, R. G....... ... .........Brooks
Emery, Frank E . ..Laramie, Wyoming
Fogg, Alvan H... .... .........Rockland
Greenleaf, A. C ........ .....Farmington
Haines, J. W....... ....... ...... Dexter
Hall, Chas. G . .............Cedar Grove
Hayden, Chas. H ... ...... .......Dexter
Johnson, C. F ..... ...............Dexter
Jose, S. O.... .... ....... .........Dexter
Leland, H. J. L...... .... East Sangerville
Leland, Will E ...............Sangerville
Libbey, R. H..... ...............Newport
Libbey, Mrs. R. H .... ..........Newport
Litchfield, L. K.................Winthrop
Mathers, Mrs. A. C. ... ........Rockland
Merchant, S. L.......... .......Winthrop
Munson, W. M......................Orono
Nowell, F. E ..... ... ... .......Fairfield
Phillips, W. H ....... ....Hancock Point
Plummer, Stanley........... .....Dexter
Roberts, M. W...... .......... ...Brooks
Robinson, O M ...... .... ........ Dexter
Rowe, W. C...... ..... ... . ..... Brooks
Spear, Mrs. Carus T...... ..... Rockland
Stoddard, Mrs. Alma S......Farmington
Titcomb, B. M.......... ... Farmington
Waterman, L. C ................Buckfield
Whittier, Phineas . ...Farmington Falls
Wooster, E. W.......... ........Hancock

*Deceased.

# TREASURER'S REPORT.

Charles S. Pope, Treasurer, in account with Maine State Pomological Society.

DR.

| | |
|---|---|
| To cash from treasurer of 1900 | $398 04 |
| interest Farmington National Bank | 20 00 |
| interest Farmington Water Company | 10 00 |
| interest Merchants' Bank, Gardiner | 6 00 |
| State stipend | 1,000 00 |
| appropriatian for Pan-American exhibit | 250 00 |
| received from annual members | 41 00 |
| received from life members | 20 00 |
| | $1,745 04 |

CR.

| | |
|---|---|
| By paid W. M. Munson, cash paid out in 1900 | $3 10 |
| D. H. Knowlton, expenses as Secretary | 12 36 |
| Maine Farmer, printing | 3 38 |
| J. W. True, expenses as member of Executive Committee | 6 77 |
| Miss L. P. Welch, services as stenographer at Norway | 25 50 |
| R. H. Libbey, expenses as member of Executive Committee | 17 35 |
| W. H. Allen, expenses at Brooks meeting | 3 00 |
| V. P. DeCoster, expenses as member of Executive Committee | 8 75 |
| Chas. S. Pope, expenses as Treasurer | 8 74 |
| premiums awarded at Brooks meeting | 27 50 |
| board bill and express bill at Brooks meeting | 12 85 |
| D. H. Knowlton, on account of salary | 25 00 |
| J. W. True, boxes for plates, vases, etc | 17 50 |
| Knowlton, McLeary & Co., bill printing | 32 47 |
| M. F. Donohue, board at Rockland meeting | 12 77 |
| C. S. Pope, sundry expenses as Treasurer | 9 88 |
| D. H. Knowlton, expenses as Secretary | 10 40 |
| R. H. Libbey, expenses as member of Executive Committee | 10 95 |
| D. H. Knowlton, express, trucking, posters, etc., at Rockland | 23 12 |
| W. M. Munson, expenses at Rockland | 5 52 |
| Miss G. P. Sanborn, expenses at Rockland | 4 90 |
| J. W. True, expenses as member of Executive Committee | 6 30 |
| V. P. DeCoster, expenses as member of Executive Committee | 9 75 |
| R. H. Libbey, expenses as member of Executive Committee | 7 46 |
| D. H. Knowlton, cash paid at Dexter meeting | 24 12 |
| Knowlton, McLeary & Co., printing | 14 23 |
| Mrs. Alonzo Towle, expenses and services at Dexter | 26 55 |
| J. H. Hale, expenses and services at Dexter meeting | 41 25 |
| W. M. Munson, expenses at Dexter meeting | 6 40 |
| G. Harold Powell, expenses, etc., at Dexter meeting | 39 00 |
| Eastern Gazette, printing posters, etc | 6 25 |
| A. A. Eastman, cash paid on account of Dexter meeting | 3 12 |
| American Express Co., charges at Dexter | 13 95 |
| D. H. Knowlton, services as Secretary | 50 00 |

| | |
|---|---|
| By paid H. M. Gates, board of officers and speakers, winter meeting..... | $52 50 |
| premiums awarded at Rockland meeting ................ ....... .... | 17 75 |
| premiums awarded at Dexter meeting ........... ...... .... .... | 296 25 |
| Miss L. B. Raynes, stenographer at winter meeting.......... .... | 30 20 |
| Chas. S. Pope, salary as Treasurer ............ .................. | 25 00 |
| D. H. Knowlton, balance of salary as Secretary . ...... ......... | 75 00 |
| D. H. Knowlton, traveling expenses, etc., as Secretary .......... | 4 58 |
| Chas. S. Pope, Pan-American expenses................... ......... | 503 32 |
| Z. A. Gilbert, sundry items paid as President... ................ | 3 28 |
| Burleigh & Flynt, engravings, etc .................... ........... | 3 38 |
| Augusta Trust Co., box rent......... .............. ............. | 5 00 |
| V. P. DeCoster, expenses as member of Executive Committee... | 2 15 |
| R. H. Libbey, expenses as member of Executive Committee..... | 5 72 |
| W. L. Churchill, board of Executive Committee.................. | 5 35 |
| Smith & Reid, binding Transactions ..... ...................... ..... | 21 25 |
| Maine Farmer Publishing Co., printing bulletins, etc........ .... | 7 25 |
| Chas. S. Pope, expenses as Treasurer..... ...................... ... | 18 36 |
| Permanent fund on account of membership of W. M. Munson ... | 10 00 |
| Cash in hands of Treasurer............ ...... .... .... ....... ........... | 121 21 |
| | $1,745 04 |

GENERAL SUMMARY.

| | | |
|---|---|---|
| Cash in treasury January 1, 1901 ........................................ | $432 79 | |
| Receipts for the year.......... ..................... ............. | 1,312 25 | |
| | | $1,745 04 |
| Amount paid as per vouchers .. ....................... ............. | $1,623 83 | |
| Cash in treasury January 1, 1902 ........................ ............. | 121 21 | |
| | | 1,745 04 |

This is to certify that I have examined the foregoing accounts of the treasurer of the State Pomological Society for the year 1901, and find them properly vouched for and correct, with the balance in the hands of the treasurer of one hundred and twenty-one 21-100 dollars.

G. M. TWITCHELL, Auditor.

Augusta, Me., January 17, 1902.

RESOURCES.

| | |
|---|---|
| Exhibition outfit consisting of plates, phials, vases, etc .................. | $150 00 |
| Permanent fund.. ............................................................ | 1,390 00 |
| Cash in treasury. ............ ............ ..................................... | 121 21 |
| | $1,661 21 |

LIABILITIES.

The only liability so far as is known to the officers is $10 due to the permanent fund, while there is due on deposit interest of permanent fund nearly or quite enough to meet it.

PERMANENT FUND ACCOUNT, 1901.

DR.

| | |
|---|---|
| To stock First National Bank, Farmington ............ .................. ....... | $400 00 |
| Merchants' National Bank, Gardiner ................................. | 100 00 |
| Farmington Water Company........... ............................ | 100 00 |
| deposit Augusta Safe Deposit and Trust Company ....................... | 790 00 |
| | $1,390 00 |
| Due permanent fund .......... ..................................... ........ | 10 00 |
| | $1,400 00 |

CR.

| | |
|---|---|
| By 141 life members......................................... ...... ........... | $1,410 00 |

# BUSINESS TRANSACTIONS.

## MEETINGS OF THE EXECUTIVE COMMITTEE.

AUBURN, January 14, 1901.

*Voted,* To apply $250 of the funds remaining in the treasury of the society together with such sum as the legislature may grant for the installing and maintaining an exhibition of fruit at the Pan-American Exposition at Buffalo, N. Y.

*Voted,* To instruct Mr. Gilbert to draw up and present to the legislature a resolve, asking for an appropriation of $250 for the above purpose.

*Voted,* That Mr. Pope be instructed to complete the collection of fruit for the above purpose, not to exceed twenty-five barrels, and forward the same to Buffalo for cold storage at the proper time.

The following outline of work was presented to cover the entire year: A spring meeting—Two horticultural classes—A small fruit meeting—Annual meeting and exhibition.

*Voted,* That the president, the secretary, and Mr. DeCoster be a committee to take into consideration the above outline and elaborate the same for presentation to the full committee.

The secretary presented an invitation from Dexter Grange to hold the annual meeting with them, and another invitation to hold a strawberry meeting with Pleasant Valley Grange, Rockland. Mention was also made of invitations from parties in North Chesterville and North Jay to hold horticultural schools with them.

LEEDS JUNCTION, February 8, 1901.

A severe storm was prevailing and only Messrs. True, Libbey and the Secretary were present.

Reference was made to fruit and other matters pertaining to the Pan-American Exposition, but in the absence of President Gilbert and Treasurer Pope no information was at hand.

*Voted,* To refer all matters referring to the above to the president and secretary, where immediate action may be required, and that they be authorized to apply for necessary space for making the same.

*Voted,* To refer the preparation of programs, location of meetings, dates, etc., to the president and secretary.

BROOKS, March 21-22, 1901.

Report was made that resolve in favor of our society to aid in making an exhibition of fruit at Buffalo had passed.

Mr. Pope reported that he had not yet perfected the supply of fruit for the purpose.

Correspondence was presented from the authorities of the exposition at Buffalo, acknowledging the receipt of application for a space of 100 square feet.

*Voted,* That Mr. Knowlton be employed to install the exhibition of fruit at the Pan-American Exposition, and perfect arrangements for keeping up the same during the exposition, for which the society is to pay him $2 per day and travel and board; that in case he cannot attend to the same he be authorized to employ a suitable person to do the same.

The secretary reported regarding the horticultural classes proposed, and it was voted that the secretary be empowered to organize one or two classes at such places and times as he may deem best.

March 30, 1901, received from Chas. S. Pope a bond as treasurer of the society.

LEEDS JUNCTION, June 21, 1901.

The secretary made an informal report on the Maine exhibit at the Pan-American Exposition.

*Voted,* To ask the secretary to prepare a statement for the public press concerning the Maine exhibit of fruit at the Pan-American Exposition.

*Voted,* That packers of blueberries be invited to send canned blueberries, at their expense, to be installed by our representatives, the same to apply to any other canned fruits.

*Voted,* That Mr. Pope be instructed and authorized to prepare an exhibition of evaporated apples for the Pan-American exhibition and to forward the same.

*Voted,* That the secretary and W. M. Munson be appointed delegates to attend the biennial meeting of the American Pomological Society at Buffalo, September 12 and 13.

*Voted,* That the secretary be instructed to visit Rockland and arrange for the August meeting.

*Voted,* That the Secretary be authorized to perfect the program and dates and make such announcements as may be necessary for small fruit meeting.

*Voted,* That the president of the society be instructed to put himself in communication with other state societies, in order to report the condition of fruit in the country to the Maine fruit growers.

STATE FAIR GROUNDS, LEWISTON, September 5, 1901.

This meeting was informal, but after discussion it was agreed

That the November or winter meeting of the society be held in Dexter November 6 and 7.

That the president and secretary make up the program and announce the same.

That Prof. Munson be sent to Buffalo to care for our fruit exhibit and represent the society at the American Pomological Society's biennial meeting.

That fruit be sent for this meeting and to keep up our exhibit at Buffalo.

That the proposed field meeting with Wm. P. Atherton be referred to the president and secretary.

DEXTER, November 5, 1901.

All the committee present.

Communication of Elmer V. Walker of Mexico urging that the meetings of the society be held earlier, and the matter was laid upon the table.

Appointed judges on exhibits as follows:

Classes 1, 2, and 3, apples, R. E. McLatchy of Boston and H. L. Leland of East Sangerville.

Class 4, pears, C. A. Arnold, Arnold.

Classes 5 and 6, canned fruits, etc., Mrs. Alonzo Towle, Freedom, N. H.

Classes 7 and 8, plants and flowers, Prof. W. M. Munson, Orono.

*Voted,* That the secretary be instructed to ascertain the cost of an engraved certificate of membership.

AT THE ANNUAL MEETING, November 6 and 7, 1901.

November 6 and 7, 1901, annual winter meeting. Met in Town Hall, Dexter, November 6, at 11 o'clock. The meeting was called to order by President Gilbert. Prayer was offered by Rev. W. A. Gould of Dexter. The program of the meetings was substantially as follows, with more or less discussion of the various topics as presented. Many of the papers and discussions appear in the pages following:

WEDNESDAY, NOVEMBER 6—11 O'CLOCK, A. M.

| | |
|---|---|
| Address of Welcome, | Prin. W. S. Brown, Dexter |
| Response, | D. H. Knowlton, Farmington |
| President's Address, | Z. A. Gilbert, North Greene |

*Afternoon.*

Music.

The Care of the Orchard.

| | |
|---|---|
| The Importance of it, | R. H. Libbey, Newport |
| Methods of Culture, | V. P. DeCoster, Buckfield |
| Fertilization, | Chas. S. Pope, Manchester |
| Results of Culture, | John W. True, New Gloucester |

Music.

Maine fruit at the Pan-American Exposition,
Prof. W. M. Munson, Orono

Music.

*Evening.*

Music.

Bees and Insects in Raising Fruit, F. O. Additon, Dexter

Music.

Address, J. H. Hale, South Glastonbury, Conn.

Music.

THURSDAY FORENOON—10 O'CLOCK.

Examination of fruit and other exhibits by the judges.
Annual meeting of Society.
Informal reports of Secretary and Treasurer.
Election of officers.

Music.

*Afternoon.*

Music.

The Selling of our Fruits.
*Small Fruits*—How to Find the Market,
How to Prepare Fruit for Market,
J. H. Hale, South Glastonbury, Conn.
*Apples*—How to Gather and Pack them.
To Whom and When to Sell.
The Biggest Price—How to Get it,
G. Harold Powell, Ag'l Dept., Washington, D. C.

Music.

*Evening.*

Music.

Reports of Committees.
The Future of the Maine Apple, R. E. McLatchy, Boston

Music.

Address—Living for Health,
Mrs. Alonzo Towle, Freedom, N. H.

Music.

The lantern for the use of Mr. Hale and Mr. Powell was furnished by the University of Maine and operated by Dr. C. D. Wood.

Prof. W. M. Munson and C. A. Arnold were appointed a committee on resolutions and their report was accepted as follows:

REPORT OF THE COMMITTEE ON RESOLUTIONS.

Your committee recognizing the fact that the present meeting has been one of the most successful in the history of the society would express the appreciation of officers and members to all of those who have contributed to its success. Therefore

*Resolved,* That the hearty thanks of the Pomological Society are due to the railroads of the State and to the hotels of Dexter for substantial reduction of rates, and to the press for liberal notices and full reports of the meeting.

*Resolved,* Further, that special mention be made of the efficient aid of the local committee, the grange, and the citizens of Dexter in making arrangements and providing such a satisfactory hall, and to the musicians who have added so much to the attractiveness of the program.

Respectfully submitted,

C. A. ARNOLD,
W. M. MUNSON,
*Committee.*

At the annual meeting held on the morning of the 7th the following officers were elected for the year 1902, R. H. Libbey and L. K. Litchfield being appointed a committee to receive, assort and count the ballots.

President—Z. A. Gilbert, North Greene.

Vice Presidents—D. P. True, Leeds Center; H. L. Leland, East Sangerville.

Secretary—D. H. Knowlton, Farmington.

Treasurer—Charles S. Pope, Manchester.

Executive Committee—President and secretary, *ex-officio,* R. H. Libbey, Newport; V. P. DeCoster, Buckfield; C. A. Arnold, Arnold.

Trustees—Androscoggin county, A. C. Day, South Turner; Aroostook county, John W. Dudley, Mapleton; Cumberland county, John W. True, New Gloucester; Franklin county, E. F. Purington, Farmington; Hancock county, E. W. Wooster, Hancock; 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, A. A. Eastman, Dexter; Piscataquis county, W. E. Leland, Sangerville; Sagadahoc county, A. P. Ring, Richmond Corner; Somerset county, F. E. Emery, Skowhegan; Waldo county, Fred Atwood, Winterport; Washington county, D. W. Campbell, Cherryfield; York county, C. A. Hooper, Eliot.

Member of Experiment Station Council—Chas. S. Pope, Manchester.

Orders were drawn on the treasurer, covering the expenses of this meeting and other items, which will be found in the treasurer's report.

LEEDS JUNCTION, December 13, 1901.

Meeting of the executive committee; all present but Mr. True.

All accounts, so far as known, were settled and orders were drawn for the same.

An invitation to hold the next annual meeting in Ellsworth, was received from E. W. Wooster of Hancock. The matter was laid on the table for future action.

A letter was presented from Prof. W. M. Munson regarding his intention of preparing a monograph upon the apples of Maine origin, and asking that it be made a joint production of the society and Experiment Station at the expense of the Station.

*Voted,* That the executive committee approve the suggestion of Prof. Munson to make the proposed monograph a joint production.

The secretary presented a communication from the director general of the Pan-American Exposition regarding the awards made to our society and other Maine Exhibitors, and it was voted that the secretary be instructed to procure two gold plated medals awarded to our society, and also a bronze medal awarded to Chas. S. Pope.

The awards as announced in this communication are as follows:

Diploma of gold medal on its general display of fruit; also collection of market apples.

A diploma of silver medal to the Maine Agricultural Experiment Station on its exhibit of apples.

Diplomas of bronze medals were awarded to the following exhibits from this State:

J. E. Bennoch, Orono, collection of pears; J. E. Bennoch, Orono, collection of apples; J. W. Dudley, Mapleton, display of apples; E. W. Gould, Bean, display of apples; F. D. Grover, Bean, collection of apples; J. W. Libbey, Hartford, display of apples; F. H. Morse, Waterford, display of apples; C. S. Phinney, Standish, display of apples; Chas. S. Pope, Manchester, display of apples; E. F. Purington, Farmington, display of apples; B. M. Titcomb, Farmington, display of apples; G. W. Whitney, Sweden, display of apples.

Diplomas of honorable mention were awarded to:

T. M. Merrill, Sabbathday Lake, display Ben Davis apples; C. F. Fletcher, Augusta, display Yellow Bellflower apples; V. P. DeCoster, Buckfield, display of R. I. Greening apples.

## PAPERS AND DISCUSSIONS OFFERED AT THE VARIOUS MEETINGS OF THE SOCIETY.

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### ANNUAL INVOCATION.

By Rev. W. H. GOULD, Dexter.

Our Father who art in heaven, whose loving kindness is in every right and thoughtful and earnest hope, whose goodness is manifested in the coming together of those who have good purposes in mind and in heart, we ask that thy grace may be manifested in our midst at the beginning of these series of meetings. We come to thee, thanking thee for thy goodness and blessings which have been with us all our days, thanking thee for the reward which comes in the autumn for the toil of hand and for the care of mind and for the devoted purpose of the heart. We would remember that thy blessings come to those who work and wait day by day, and we learn by our experience that our own joy and satisfaction and delight in life increase as we learn to thank and know thee as the one who rewards our toil and our thoughtfulness and all our loving service. And so we find it to be fitting at the beginning of any earnest enterprise, and so at the beginning of these meetings, to bring our thought close to thee, to remember in gratitude how gracious thou hast been to us, how thou hast prospered us in our effort and in all our enterprise, how thou hast brought and given satisfaction and joy and happiness to us.

We thank thee for the peculiar privileges that shall be ours during these meetings. We pray that thou wilt increase happiness to those who renew old acquaintances and old friendships and in the forming of the new; that thy Spirit may be so manifested in kindness and thoughtful consideration and desire to give and to receive, that there shall be great reward in the meeting together.

Do thou bless with thy loving kindness the absent friends, those whom some of us have left in our homes. Be with them; guard them from every danger and all peril and all harm. Preserve thou us and them and all thy people, that as we strive for the better things of life, as we give the work of our hands and the devotion of our minds, that we may accomplish better results, that more of comfort and more of convenience and more of happiness may come into our homes and into our lives; do thou bless our endeavor. Do thou be with these brethren who meet together to exchange their experience and their knowledge. Bless those who give and bless those who receive. Let kindness and mutual regard be manifest in all the meetings.

Hear these our prayers, forgive us, we pray thee, our shortcomings which are too many, and prosper us by the presence of thy Holy Spirit in all our thought and in our speech and what we do and what we are striving to become. We ask it in His Name,—Amen.

## ADDRESS OF WELCOME

By Principal W. S. Brown, Dexter.

In behalf of the citizens of our town and village, I extend to you a sincere and cordial welcome to our community. You have met here for consultation, discussion and deliberation. You are interested in the development and promotion of an important branch of our agricultural interests.

Though farming always has been, is, and must ever be the basis of the world's industrial activity, yet it has never received the attention it has merited. Most men have followed it more as a fate than a vocation. A youth of today, standing on the threshold of life, confronted by the momentous necessity of choosing his sphere of labor, of taking his place among the millions of competing toilers, too often turns his back on the farm and casts his lot with those who are already congesting the business and professional avenues.

Why does he leave the only field which today is not overcrowded for one where the laborers are many and the harvest small? The answer is not far to seek. There are two reasons.

One is a prevailing notion that farming is a sort of vulgar occupation. No more false or pernicious notion could be conceived. The dignity of farm labor was recognized by the Romans and they gave to it the benefit of the best minds they produced. Rome's greatest poets sang of the beauties of rural life and her historians chronicled the wealth of her rural classes, but all feared when Rome in her hour of need called her soldiers and statesmen from the plow, and they passed away before the approach of a more splendid but far less substantial age.

The second reason, that farming is unremunerative, is true only to the extent that one fails to bring to the management of his agricultural business the same degree of skill that the business man brings to the management of his business interests. Too many farmers leave everything to the seasons and soil, and, acting on the consoling assurance expressed in the old adage that God takes care of the lame and the lazy, see their buildings run down and their farms run out. This class of farmers are those whom we hear forever complaining of the hardness of their lot and the unprofitableness of farming. I retain memories of these men. Their sleds were housed during the summer and fall under the open sky; their wagons were sheltered the same in winter; their mowing machines, rakes and plows were found when needed where they were last used the year before. If, finally, the sled broke down with a load of wood, or the cart with a load of hay, or the mowing machine gave out in the half-mown field, they would invariably curse their luck.

I am no believer in luck. What is termed good luck is the result of good calculation and bad luck is the result of bad calculation. I believe if every farmer should bring to the management of his business that same degree of careful and systematic supervision that characterizes every other branch of industry today, his success would be practically assured. His returns would not of course be large, but the balance would be on the right side of the ledger. There would be no six per cent mortgage to torment his peace and devour his substance. Thousands have grown rich out of his toil and thousands are still growing rich. Too long the wealth he has created has flowed into the pockets of those whose only title rests on nothing firmer than connivance and cunning. He must take his lesson from the events transpiring in the great industrial world about him.

Organization, consultation and co-operation is the slogan of the manufacturer, the mine owner and the railroad magnate. Whether this policy is to prove beneficial or the reverse, it is a condition of the times,—a situation, not a theory.

Education, organization and co-operation are to bring to the farmer his full share of the fruit of his labors. Much along this line has already been done by the Grange and kindred societies like the Maine Pomological Society, but much more remains to be done. I believe it is the province of this society to consider not only what varieties of fruit are the most profitable to cultivate in our State and how best to overcome the many hindrances in the way of fruit raising and fruit growing, but also to consider how fruit raisers are to realize the largest profits from their crops.

Again, I extend to you, one and all, a hearty welcome to the hospitality of our town, and trust that your visit here may result in mutual good, and that when you return to your respective homes you may carry with you pleasant recollections of your visit.

## RESPONSE TO ADDRESS OF WELCOME.

By D. H. KNOWLTON, Farmington.

I can assure you, sir, and the good people of Dexter, that we are exceedingly glad to be with you. We have anticipated rather more this year than usual, because the invitation from the Grange reached us early, so that we have had all the year to think about it and anticipate it, and I can assure you that up to this point we have not been disappointed in our anticipations.

The Maine Pomological Society was organized nearly thirty years ago. It was organized when the industry in the State was in its infancy. Brother Gilbert, who has the honor of presiding over our body at this time, had the earlier honor of being the society's first president, and largely through his efforts the organization was perfected at that time, and during all these years that have intervened he has been one of its warmest friends and wisest counselors. He, perhaps better than many in the State who were interested in fruit culture, could look forward into the future and see somewhat along the line of possibilities what we have shown to us here today; and he, I am sure, for I have heard him so state, looks into the future still further and anticipates for Maine fruit and its growers more triumphs than have yet been won.

The industry then was in its infancy. Sometimes I think that it has not outgrown its infancy; but, at the same time, when I find how many men there are in the State who have benefited by the teachings of the society and the inspiration which they have gained from attending our meetings and reading our transactions, I am sure we can see that we have accomplished much. I regret that we have not accomplished much more, but that we have not accomplished many things is not our fault.

Our Society, and the fruit growers of the State, are faced by important fruit problems today. I don't know why it is, but somehow it seems that every step we advance, the next step is more difficult. It is the plan of the great Creator, I believe, to make us work harder and work better.

But we are doing all we can to meet these problems, and our program for this meeting is shaped so far as possible to meet these questions, these difficulties, where we can not only give you some good lectures by eminent authorities but mutually converse upon these subjects and bring out the difficulties. I know the people of Dexter will be well pleased with the program. We have flattered ourselves that it is an exceedingly good one; and I anticipate that as one result of our meeting here you will go to your homes much wiser in fruit culture than you are now.

Franklin county is one of the smaller counties in the State, but the fruit growers of the county this year will receive over $200,000 for their apple crop, and it is the largest item in the way of agricultural products that our county has ever had in any one year.

I can assure you again that we are exceedingly glad to be here. We know we are going to have a good meeting and we hope that your anticipations will not be disappointed.

Now, thanking you still further for your cordial invitation, sir, and realizing, as I have already said, that we shall have a good meeting, I gladly give way to those who are to follow.

## ANNUAL ADDRESS.

Hon. Z. A. GILBERT, President.

*Ladies and Gentlemen:* An established custom of this society, handed down from its first organization, makes it incumbent upon me to address you at the opening of this annual convention on such points connected with the work of this society, and related to the industry it was instituted to promote, as may be considered important to its further usefulness.

The work of such an organization can never be completed. As step by step progress is made new conditions arise, new obstacles are met, new enemies encountered. These make new demands upon our intelligence. Study and experiment must ever keep on. New conditions must be fathomed, obstacles in the way must be overcome, enemies must be subdued. Thus will there ever continue to be a demand for such an organization as ours, and always problems in sight calling for solution.

Fruit growers are to be congratulated on the condition of the fruit market the present year. Demand is sharp and prices high. Maine apples of late have been gaining an enviable reputation among both dealers and consumers wherever they have been distributed. The crop of fine Maine apples of last year found a market largely in the South and West. Their superiority was such as to create a sharp demand for more. It was to stimulate this demand, and still further show the merits of the products of Maine orchards that this organization made an exhibit last spring of our late keeping commercial varieties of apples at the Pan-American Exposition at Buffalo. The reputation thus gained and kept up is plainly manifest in the sharp demand and wide call from the same quarter for the crop of Maine apples of the present year. Such facts may well be a source of encouragement to our society in the noble work it has done for the fruit industry of the State, and should be an incentive to further effort along similar lines.

There never was a better outlook for the fruit grower than at the present time. The population of the country, all hungry for fruit, is increasing year by year, and far more rapidly than is our ability to respond to the call for more. Far and wide, among ourselves, our neighbors, other states and other countries, the demand is for more fruit and that of the highest merit without regard to cost. Business is booming in all directions, people are at work and likely to be for a series of years to come, wages are good and money plenty, and among Americans it is ready to be spent freely.

The only unfortunate feature of the situation the present year with the grower of fruit is that there is not a full crop of fruit with which to meet the wide demand and liberal prices at command. This leads directly to the important question of fruit every year, and the means through which annual bearing may be promoted. I am aware this is an old problem, but in Maine orcharding it is still important. We want not only better fruit, the best, but we want it in the off years. Our fruit is too much a volunteer crop; we want it at command. While it may never be possible to overcome in full damaging conditions of weather, yet I maintain that a compromise, at least, can generally be secured with those climatic conditions that otherwise would result in total failure. Maine orchards are starving, that is, the most of them. A more liberal policy of manuring and of culture is imperative with nearly all our Maine orchards. Our society can do no better service than to dwell upon this one fact until common management is greatly improved in this direction. The means through which our expanding orchards may be fertilized up to the limit of the ability of the trees to respond is the most important problem that confronts Maine fruit growers at the present time.

Fruit growers need inspiration as well as instruction. A knowledge of how to grow fruit is of little avail where there is not first a faith in the business and a confidence that it may be made successful. The great fruit crop of 1896, when there was more fruit grown than consumption called for or the market could handle, gave rise to the question with growers whether the country at large had not already passed the limit of demand with their planting of orchards. Certainly evidence at that time unmistakably showed there was more fruit than market. It is not strange perhaps that confidence in the orchard as a source of profitable revenue was shaken for the time. But since that year every barrel of choice apples produced among us has found a profitable market awaiting it clear down to the present autumn's harvest when purchasers are on the run all through the State after them at $3 and upward a barrel before they were placed in storage. I claim it a safe conclusion and believe that events prove that there will always be a paying demand for all the fruit we may grow, save alone the rare occurrence of a full crop in all the fruit growing sections of the country the same year. This may not again occur in a generation, and is too remote a factor to stand in the way for a moment of a still further extension of the business.

There are many other matters connected with the business of fruit growing that may well receive the attention of our society. Our method of disposing of the products of the orchard is without system, order or sense. Cold storage is a matter with which we shall soon be under the necessity of grappling if that time is not already at hand. But it is not my purpose to confuse by rehearsing a multiplicity of duties. Enough has been presented in that direction.

In closing there is one other matter I wish to call attention to, and that is our exhibitions. They must be made attractive. Neatness and order should everywhere abound. We must not become fossilized in forms and methods. The art of showing must be studied by those in charge. The work of other societies conducting similar work should be visited with a view of catching up new ideas. Progress is ever onward. Classification must be modified to meet new demands. There never is a place to stop and stand inactive.

Fellow members, we have everything to encourage us in our work. We have thrown off the necessity of an admission fee at our doors, which so long has stood in the way of a general attendance on our exhibitions. Nor is it longer necessary to join with any other organization to brace us up in our efforts. Our annual proceedings are a record of faithful and efficient effort that we may look back upon with satisfaction and with pride. Let us in our further labors strive to emulate the example thus set before us by those earlier workers.

# THE CARE OF THE ORCHARD.

By R. H. LIBBEY, Newport.

## THE IMPORTANCE OF IT.

The subject that is alloted me is the importance of orchard culture. Now that is but a small part. Had I time to take it from the seed, and carry it through till you roll up the checks or bank bills, I could explain better my way,—but this of mine is only the importance. Now at the swell places, and this seems to be one, the first course is soup. Now the secretary has seen fit to put me on as the soup part, and I represent the soup part of this,—just simply the opening.

The importance of orchard culture is but one thing and that is the commercial value,—nothing more. I have no right to go on and tell how, the manner, the fertilizer to use,—that is not in my part; it is simply the importance. Now the importance of orchard culture is the value that you can get out of it. It used to be different years ago. In my boyhood days, when apples were not as plenty, we cultivated our orchards for fruit for our own use, but that has gone by. Such a change has come about in fruit, it has become so much better, that there is always a plenty of good nice fruit without much cultivation for home use, and now the cultivation is for what we can get out of it. A man in my town who was eighty years old, only a few years ago set an orchard. He didn't think he would live to get any fruit, but he did live to old age and got some fruit from his seedlings, a little more than he had use for at home,—and sold it for twenty-five cents a barrel for cider. He passed away. The property came into his son's hands and I advised his son to graft those trees. He didn't set them in a square as an orchard, but he set them round the fences. Living in a corner he had two sides, and between his field and pasture he had 200 trees of seedlings, seedlings that he got from pummace by the side of the road, and not over and above thrifty but still they lived and did well. The orchard changed hands, the farm changed hands, and the man that is on it now did graft it a few years ago and it has commenced to bear. This year he had about 75 barrels from them; the year before he had 199 trees grafted and about 175 barrels.

He told me a short time ago that he was going to set out a couple of hundred more trees,—that he was getting more out of his orchard than he did off his whole farm. That was the importance of it because he took care of it.

There are two other men that have done similar things. One of them has left his orchard without any cultivation on one side of the fence and the other has cultivated his, and I have noticed the difference. The man who has cultivated his is getting about 200 barrels this year—the other man is getting ten or fifteen. That shows the importance.

Here is another man down in Vassalboro, from two acres of orchard got 358 barrels of winter fruit. He took care of his orchard. Three hundred and fifty-eight barrels from forty-two Baldwin trees, giving an average of a little more than five and a half barrels to the tree. Some of them gave ten. That was the importance. I wrote Mr. Smiley, inquiring something about it, because I was interested in it. He wrote me that he pastured his orchard with sheep,—that there was a large pasture joining and he took pains to yard his sheep every night, or about every nignt, in that orchard, and that is about all he did to it. And the income,—he said that many of those people there had, and were getting $300 an acre. He thought there was no other crop like it.

Now that is the importance of orchard culture. That is about all that it is necessary for me to say, that unless you cultivate and take care of your orchard you can't get any income. If you sit on a nail keg in the store and smoke and say farming don't pay it won't pay, but when you get up and go to work and say it must pay and it is going to pay, then it will pay. And it is just so with orchards.

Mr. J. H. Hale said he kept his orchard land constantly stirred, harrowed and plowed and cultivated. This question was asked Mr. Hale: "How many years do you continue this cultivation?"

A. Tell me how long I will live and I will tell you.

Q. Do you remove many crops from the orchard?

A. No, sir, I am growing apples.

Q. What do you put on for a crop?

A. Crimson clover, cow peas, vetches,—mostly clover and cow peas. This question, what other crop do you grow in the orchard,—of course it is admissable in the early days of an orchard to grow something there, but you never know when to get out, and when you try to handle two crops on the same bit of land you get into trouble. Some of these old fellows here could tell you, if their wives were not here, that in the early days they tried to have two girls, went to see one girl Thursday night and the other Friday night * * * and they made a miserable failure of it. Now fruit tree planting is a good deal like the best girl, she wants nursing and coddling and taking care of right straight along all the way through. Give the orchard the whole use of the land and if you haven't faith enough in your trees and in your business to do that, don't go into that kind of business. You will find the men in this country who are making the greatest success are men of one idea. They are right after that particular crop, that is what they are after and nothing else.

### METHODS OF FRUIT CULTURE.

E. P. DeCoster—As you are riding through the country, you will notice that nearly every farmer has adopted some method of fruit culture. Some we notice pasture their orchard to swine and allow them to root the soil to keep it loose and from becoming root bound. While others pasture it to sheep and allow them to keep the grass down and enrich the soil, while others keep their orchards under the plow; while others believe in mulching with meadow hay and even sawdust; and there are many others who have adopted no method, but have simply placed their trees in the ground and trust to the hand of Providence to do the rest. Such persons are as sure to fail in fruit culture as in any occupation they may pursue.

I believe in raising our own fruit trees. I have not fifty trees on my farm but what I have raised from the seed, and it has been a great pleasure to me to watch them and care for them from the time they first broke through the ground to maturity.

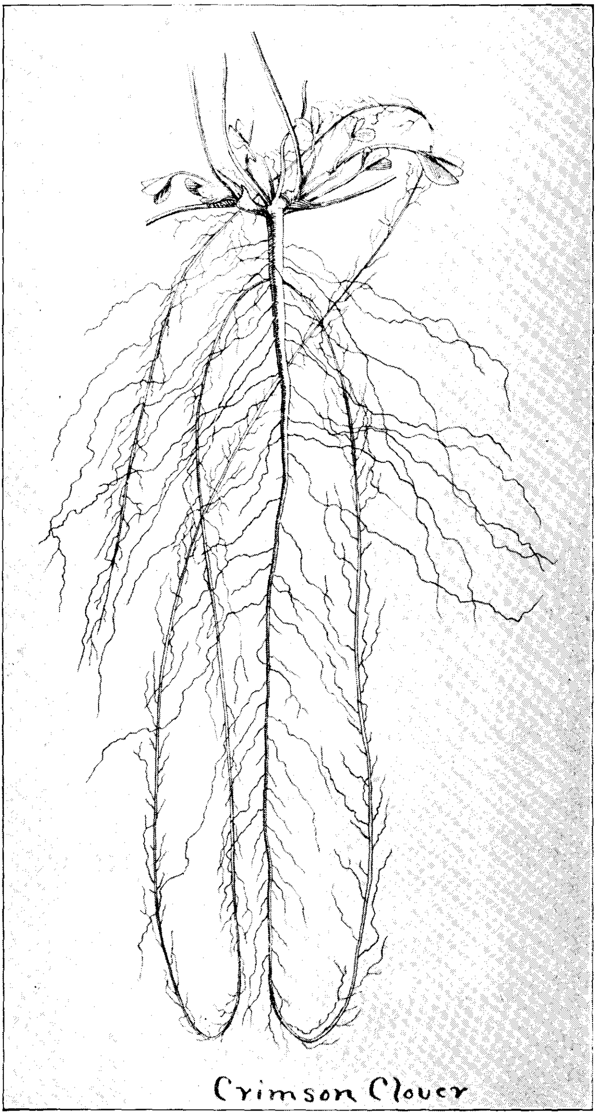
I will give you my method of raising my trees. I select a good deep loam soil, and if I want one row of trees I plow a strip of land some six feet wide; if I want two rows, I plow four feet wider, then plow a good furrow in the center, make a good ditch of it, then I fill that partially full of dressing and work it well in with the soil. Upon this sow your seed. I use pumace from a cider mill and cover it about the same as I would corn.

This must be done in the fall as the seed must stay in the ground through the winter. I let these trees grow the first year as they come up, excepting I may trim them some. To keep the snow from breaking them down, drive a stake in the row and tack some boards on each side. The next spring take them all up and set them in a row one foot apart. If these trees are properly held, mulched, and cared for in three or four years from the seed they will do to set out. I prefer to raise them as seedlings and graft in the limb. I believe I can get better shaped trees by so doing and they will come into bearing as soon as those grafted in the nursery. In two years after setting out will do to graft. In grafting trees those scions that are making a large growth I allow the sprouts to grow which will act as a preventive from blowing out. Cut them out the next spring.

*Setting out trees.* Many of us are not particular enough about setting out our orchards. Who is there of you who would expect any return from your corn and potatoes were you simply to plant them in the ground and let them care for themselves. I find the profit and income is commensurate to the care and labor you put into it. No one crop we may raise upon the farm will show good care sooner and profit surer than a fruit tree. I am convinced that two-thirds of the fruit trees that are set upon our farms die from starvation and never pay the first cost of the tree.

As you are traveling through the country you may not ask how a farmer is caring for his fruit trees, a single glance will tell you. If they are pruned, mulched and cared for as they should be, even an experienced eye will tell you the variety of the fruit as you will notice the Baldwin, Greening, Spy, Russet, Ben Davis, Talman's Sweet, etc., all grow their branches in different shape.

*Pruning trees.* We are not paying enough attention to the pruning of our trees. Fruit and not wood is what we are after. You cannot grow good fruit and a surplus of wood. I had an experience with a Beurre d'Anjou pear tree which taught me a lesson. The tree blossomed well every year but the fruit did not set and what did was small and would wither when put into the cellar. I had made up my mind to discard this pear, so grafted one tree and left two good limbs. Those two limbs were loaded with pears and matured well upon the tree. I found




FROM DRAWING SHOWING ROOTS OF CRIMSON CLOVER.

By courtesy of Prof. John Craig, Cornell University.
See article on Cover Crops for the Orchard, page 57.

the pear was all right and the fault was with me. After trimming the other trees well it had the same result

*Thinning of fruit.* I believe the thinning of fruit is a question we should look into more than we do. Nature perpetuates all fruit by the production of its seeds. It brings just as heavy strain upon the tree to grow and mature the seeds in a small and wormy apple as it does in a good one. I believe by thinning our fruit we will get a better sized, better colored and a better flavored apple. I much prefer one good apple than two poor ones. It can be done at any time after the fruit is well set, the sooner the better. When a tree is allowed to bear so heavily that it takes all of the nourishment from the tree and the tree gets no growth, disease is after that tree, and it takes from one to two years for that tree to get into bearing again. I believe if a tree is properly dressed, pruned and thinned, it will produce fruit every year. The question is often asked when to prune trees. I believe the best time is when you set them out and then do a little every year. How often we hear that father or mother say, give me the training of a child until it is twelve years old and I will characterize his whole life. It is the same with a fruit tree. You can form that tree into any shape you choose. Many are asking what time of the year is the best to prune trees. I make it a rule to prune when I have the time; any time after the leaves fall.

I believe the future prospects are good for fruit growers. Many and many a farmer in Oxford county, this present year, have received as much for their fruit as their farm would be worth outside of their orchard.

Q. At what time and how do you thin fruit? It is not much practiced here.

A. At any time after June, after it gets well started. Did you ever notice, Brother, that an apple that is perfectly clear, not touching anything, that you don't see any coddling worms working on the limb. They always work where limbs come together or leaves touch. I thin any time after June; rainy days in haying is a good time. This year the hot weather in June thinned the fruit quite badly for me, although I raised quite a good average crop.

Q. What time would you prune? You told us not to prune in June.

A. Any time after the leaves fall. I hear some parties advocate trimming in the fall and letting the limbs lie beneath the trees as a preventive to the mice; possibly there is something in that.

### FERTILIZATION.

CHAS. S. POPE—Our president stated this forenoon that three-fourths or seven-eighths—I have forgotten the fraction—of the trees in the State of Maine were dying of starvation, and there is too much truth in this. And even those which are not dying of starvation are simply existing and giving a crop only when,—well, the school-boy said the hitching-posts were bearing this year—and that is just the year when there is no profit in fruit.

Now, I can remember when Mother Nature was so kindly that all that was necessary was for us to set a good tree in good soil in the pastures where it still retained its fertility from the forests that had not been exhausted. All that was necessary when I was a boy was for us to set a good tree and keep away the insects and we would raise good crops of apples year after year. But as time goes on and the fertility of the soil is exhausted, it now becomes necessary for successful fruit-growing to keep the condition of the soil up more in the condition that it was in fifty or seventy-five years ago. And the soil we don't want simply to maintain that growth, as we could easily in any soil that was fit to raise a crop, but what we wish is to grow fruit in larger quantities and of better quality and every year, so that when fruit is worth something we will have a crop of fruit to sell. What seems to be lacking in our soil now is the lack in the physical condition as much as anything to grow good trees. The soil seems to be hard and dense. It is lacking in vegetable fibre, the humus of the soil; the decaying organic matter that we ought to have there for the successful growth of the tree is lacking. Therefore we must look first to the condition of the soil before we begin to fertilize; have our soil in that condition where the trees can take hold of the fertilizing material before anything else. If we are putting this fertilizer into the soil, we want to put it in in such shape that the trees can get it out and improve on it. Therefore it behooves us not only to add this fertilizing material but to add it in such a manner and in such a way that the trees will get the benefit of it. For this reason I would not fertilize on the top of the greensward under a tree, in this case because the grass would steal the greater part of it, and we are fertilizing the trees.

My method and what I would recommend would be to keep the orchard under the plow. We are not all situated as Smiley of Vassalboro, or DeCoster, is,—have a large lot of waste pasture land where we can put in a great flock of sheep and let them feed during the day and then drive them up on to the orchard on the top of the hill and yard them in, stealing from this waste land and pasture and bringing it to the orchard. Most people are obliged to fertilize their orchards either with barnyard manure or commercial fertilizers purchased, and to these I say the time has come when we must raise our best fruit and our best trees on cultivated soil as we would any other crop. It is what they are doing all through the western country, through New York State, for years. If we wish to raise fruit when other people have no fruit, get it year after year, get our big crops, put in the plow and keep them cultivated. Begin to plow as soon as the trees are set. Plow lightly; keep the roots below. I would not advise going into your old orchards and putting the plow in deep and tearing the roots to pieces and ruining the trees. If you have an old orchard that requires this, put your plow in and just barely turn the turf; then get your turf rotted and keep it down with the cultivator and harrow. Then whatever is put upon this soil the trees get the full benefit of.

The constituents called for in the tree are the same as for any crop, but perhaps in different proportion. They call for a certain amount of nitrogen to keep the foliage in good thrifty condition, for without this you can have no good fruit nor no good growth of the tree. But too much nitrogen will grow you foliage at the expense of fruit. Potash in large quantity is called for, for 60% I think of the fruit, ash of the fruit, is potash and quite a large per cent. of the tree. A small amount of prosphoric acid, smaller than is needed for some crops; lime; you will find trees growing in a limestone soil make a good thrifty, vigorous growth and ripen their wood early so that they stand our hard winters. Therefore in some of your soils it may be necessary to add a little lime. It is impossible to tell how much of each one of these constituents may be required in any orchard. What is lacking in the soil must be found out by your own experimenting.

But one thing you cannot expect, to follow the directions I am giving, plowing and harrowing and adding only the commercial fertilizers, the minerals as you buy them in the phosphates, and in this way to keep your ground in good mechanical condition. There is lacking in the soil the humus. Something must be added to keep this soil loose and light. This can be done with cover crops. Nature abhors a bare surface. She is always planting something on a naked soil, and it is much better to raise weeds than it is to keep that soil bare the year round. Therefore, cultivate the first of the season, keep the ground thoroughly mulched with a light dust soil until August or the first of September, then plant some crop that shall leave the fibres through the soil and keep the soil loose and light. In this way you retain the moisture in the soil which is one of the great advantages of keeping your soil loose and light. That is one of the methods of holding the moisture in the soil. The heavy, compact, dense soil dries out very quickly, and the apple tree requires, especially when growing a crop of apples, requires an immense amount of water for a large crop. Therefore never plant a crop in the spring that shall take all through the months of June and July moisture from the soil very much faster than the bare surface itself, but keep it plowed loose and cultivated lightly through the first of the season, keeping the ground full of humus, full of fibres to hold the soil loose and light, to prevent the evaporation of the water, to conserve the moisture through the summer; then when it comes early fall, plant rye, wheat, peas or something of that kind to cover the ground through the fall and winter, and all the little fibrous roots decaying in the soil will keep up the supply of humus and keep it loose and light for the next season to conserve the moisture through the coming year.

One of the best fertilizers for the orchard for this reason, to supply the lack of humus that is in nearly all fertilizers, is stable manure. But in the larger part of stable manure we get more nitrogen than the trees need, therefore making it a very expensive manure, unless we put a very small amount of the stable manure and supplement it with potash and phosphoric acid in mineral form,—ground bone and muriate of potash. Therefore

I would recommend both the stable manure and the potash and ground bone in addition as the cheapest fertilizer that we can apply to the orchard, for in the stable manure we get a good supply of humus to keep the soil in good mechanical condition.

Q. Mr. Pope, a question, please. Does not phosphoric acid enter largely into the composition of fruit, especially the apple?

A. Yes, that you would get in the ground bone which I recommended—potash in a large proportion.

Q. You say that in the ash of the apple there is 60% do you not?

A. Of potash. We have a larger proportion in the apple and in the apple tree of potash than we do when we are growing the cereals and our common farm crops on the average, so that we require in orchard culture a larger proportion of potash than in the ordinary farm crops, and less nitrogen.

Q. Wouldn't you want then, in a fertilizer, quite a large per cent. of phosphoric acid as well as potash?

A. I would have enough to keep the trees in good, healthy, growing condition, which you would get in a small amount of stable manure and ground bone with muriate of potash to make up the lack in potash, to give color to your fruit and firmness. If we were so situated, as some parties are, that we could have our waste land pastured with sheep and bring in the fertilizing material from that part of the farm to the orchard, as Brother DeCoster and Smiley of Vassalboro do, it might be the better way for fertilizing the orchard. We have had perhaps more or less apple orchards where they were too rough to put in the plow, or even where they were quite smooth, where we have let the hogs do the plowing, then spreading on the fertilizer, using the hogs mostly for cultivating and not expecting fertilizing from them but adding to the fertilizer as needed.

Q. In the German potash salts—I think you have used them to a certain extent—what proportion would there be of potash and of phosphoric acid relatively?

A. There would be no phosphoric acid in the potash salts; that is supplied in the ground bone. That is why we mix, using phosphoric acid with the application of ground bone, the surplus potash in muriate of potash, and what nitrogen we get—we get a small per cent. of nitrogen from the ground bone, making up the rest in stable manure.

Q. Then if you use one ton of ground bone, you would use what proportion of muriate of potash?

A. I would use 500 weight of muriate of potash.

Q. Are the German salts a better source of potash than wood ashes?

A. It is no better if you can get the wood ashes, but with us it costs considerably more in the form of hard wood ashes than it would in German salts.

Q. Salts are cheaper?

A. Ashes with us cost too much, twenty-five cents a barrel.

Mr. KNOWLTON: Mr. Pope, I would like to call your attention to this Stevens' circular which has been sent to me for distribution, whether you know anything about these goods or not?

A. I don't. I never have purchased any Canadian hard wood ashes for the reason that I think they are too expensive and I am a little fearful that they may not contain the potash which good hard wood ashes ought to have,—a little fear of adulteration.

Q. Is it advisable to plow in young orchards in the fall of the year?

Mr. POPE: I would not advise plowing in the fall. I wouldn't want to stir up the soil and let the air in about the roots in the fall, but do the plowing in the spring. It is liable to expose more or less roots and let the air in about the roots, and, as you know, a root coming in contact with air and frost is almost sure to be killed. Therefore, plow in the spring.

President GILBERT: Not necessarily kill the tree?

Mr. POPE: No, but kill that root and the better way would be to let the sod remain as a protection until spring and then plow and cultivate in the spring.

Q. I would like to ask the gentleman relative to mulching, what is his opinion of that. Years ago it was advocated very much and late years not so much. I would like to hear what he thinks relative to that.

Mr. POPE: If you have plenty of mulching to cover the ground, or if while your trees are small, if you mulch as far as the roots can possibly extend, and mulch deep enough to kill the sod, that is sufficient. But with most of us, the mulching after a few years does not extend far enough; it is expensive; and there is no mulch any better probably than a light soil that we get from cultivating. After plowing, cultivate lightly; put in a cultivator that will not work very deep, and just keep that surface stirred and keep a light dry mulch. You can go to my orchard now, you will find an experiment we are carrying on at the station, where four rows of trees are plowed and cultivated and four rows of trees are mulched. These trees are large enough to bear a barrel of apples,—four or five inches in diameter,—one to two barrels of apples possibly, and without any doubt those roots now extend fifteen feet from the tree or more, and in mulching of course it is impossible to think of mulching more than five or six feet from the tree. It is plainly visible that the trees that are cultivated and the entire surface kept mulched with the loose soil are doing much better than those that are mulched with a good depth of mulching five or six feet from the tree.

Q. You would call the mulch the cheaper method?

A. I call the plowing and cultivating much cheaper unless you have a large amount of waste hay. With us, meadow hay and such mulching as we can get, straw and fine shavings, will cost more, much more than the cultivating, for after once plowing it is but little work to run the harrow through every few weeks.

Q. Then are we to infer that you consider the chief advantage of mulching is keeping down vegetable growth?

A. Keeping the soil loose and light so that you can save the moisture, which is done by a mulch of dry earth as well as by a mulch of meadow hay.

## RESULTS OF CULTURE.

JOHN W. TRUE—In early times when our country was first settled, all that was necessary to raise all the apples required for family use, was simply to set the trees and they would take care of themselves, eventually becoming, in many cases, very large trees. They were seldom grafted, and *if* grafted, usually to some fairly good cooking apple but the situation of the trees plainly shows that they received no culture.

To-day it is very different; if an orchard is set, at least in the older parts of the State, it must be cultivated if we expect to obtain good results.

And what are these results?

Without care and culture the trees will go, one by one, to the brush pile, until at the end of five years, when the young orchard well cared for should begin to show signs of fruiting, not one tree in ten will be found worth saving. If they can have two or three years of care and culture they will get rooted, and, with hardy sorts, will cling to life for a number of years, but with steady culture for fifteen years we get a good thrifty tree, with trunks measuring twenty-eight or thirty inches in circumference and paying a profit.

Culture, we should understand, means any method of care that will keep the grass down and the tree growing. It may be by mulching, or by plowing and harrowing.

We had the opportunity, the past season, of seeing some of the results of simply plowing and harrowing, no dressing being used. It was noticeable; as far as the orchard could be seen the large, dark foliage and the more abundant and better fruit plainly told the story.

Another result of culture is that an orchard properly set and cared for will be an even stand of trees. It is seldom that a tree will be lost except by accident or an ice storm, something that we cannot foresee and guard against.

With proper culture the roots run deeper and will spread over the whole ground. We have found them two and one-half feet below the surface, firmly imbedded in solid pin ground fifteen feet from the tree at the end of ten years. With such roots a tree will not be affected by any drouth that we have in this climate, and will hold its fruit much better, in our opinion, than a tree growing in grass with its roots near the surface.

The fruit from a well cultivated orchard, (which should include pruning,) will be far more abundant and will be produced more regularly; it will also be of better size, and if the pruning has been properly attended to it will be of just as good color; and we are all well aware of the fact that it is the well grown fruit that is sought for by the buyers, and will bring the most money, the "Results" that we are all striving for.

Q. I would like to ask Brother True if he has adopted any method to try to kill twitch grass?

A. Some of my orchards I have plowed for fourteen years and now the limbs are getting so near that I cannot get a team in to do very much work and I have been for the last two or three years almost stuck as to know what to do. Two years ago I put some sheep in one of the orchards for a month or two, long enough to keep the weeds down, and then again last year for about the same length of time, just enough to keep the weeds down—more or less clover came in and very good feed there. And this last spring I cut off some of those under limbs so as to put my team in and we got out the spring tooth harrow and went over it thoroughly; it was in April on gravelly ground, just as soon as the snow was off, to tear it up thoroughly, and again in about two weeks more we went over it again, and then I put in hogs. And it has looked finely. I got more than a hundred bushels of apples out of it. I will say, back of that, in this plowing and cultivating I put on barnyard manure and dressed it very well, and then I put on ashes and from some reason or other it is looking exceptionally well this year and the twitch grass is very nearly all out again. I don't believe in putting in too many hogs. You have got to use your judgment in putting them in, for they won't use any in rooting around the trees. They will take some one tree perhaps and root it to death and neglect other trees. You have got to watch that quite carefully.

## THE SELLING OF OUR FRUIT—HOW TO FIND THE MARKET FOR SMALL FRUITS.

By A. A. EASTMAN, Dexter.

First you must have a good location near a local market and shipping station. In order to succeed in this as in any other business it is absolutely necessary to keep thoroughly up with the times. The picking and gathering of fruit is another important point to know, the proper time and stages of development to gather the fruit according to your market. The small fruits should be picked in the cool part of the day and at once put in a cool place, and not picked when wet with dew or rain, the fruit will soon spoil and be worthless. But if you are close to a local market get out early and pick the fruit with the dew on and have it on the market early as possible. Do not send fruit of poor grades to market, have the small fruit graded by the pickers, as it is hardly possible to assort afterwards, and see that all your fruit is up to an established standard.

Sell these as first-class goods and if you market the seconds mark them as seconds. As to the manner of selling this is a local question. If you are close to a small town sell direct to the consumer, but endeavor to have the man who handles your fruit in touch with you. If you are obliged to ship to a commission merchant get him acquainted with your fruit, go and see him and get acquainted with what he is doing in the markets. Establish confidence between yourself and your dealer and then do nothing to shake that confidence. Just how you will do this will depend upon yourself. While fruits are the most profitable source of revenue from a farm they might in many cases yield double the profit if they were marketed in a proper manner. The trouble with fruit growers in Maine and New England States, is they do not make a business of it as a rule. You do not want to mix farming in with small fruit culture but very little. If a person is farming he wants to raise what small fruit is needed in his family; if he is making a business of small fruit culture he cannot attend to farming and make it pay as a rule. Farmers frequently complain that they fail to get satisfactory prices for their products and find fault with dealers because they will pay no more when in reality the trouble lies with themselves. The sale of any fruit depends very much on its appearance to the eye. Pick your fruit honestly in a nice clean box or basket, and don't forget to put some large berries in the bottom; the people will find them and give you lots of credit. Always insist on a fair price and back it up by a comparison of value and you will have no trouble in getting and holding your customers. Be firm and courteous under all circumstances; don't get angry if they do. A neat personal appearance is a good stock in trade. Wear a good business suit and keep your shoes blacked and be in condition to approach the wealthy family and make a good impression and never offer customers berries in an old dirty basket. Keep your horse and wagon as neat and attractive as possible. Fruit is or will be what we make it, and thus more than a slight difference in soil. Make pets of your plants and trees with generous and reasonable care born of a wish to succeed. Love your business, make your own recod as a fruit grower.

In using berry crates I used to buy old second hand crates at the markets and pay ten cents each for good, bad, indifferent and I had to put out from ten to thirty minutes in labor for repairs and to clean them up for business, and then they were old crates, dirty and poor. I got sick of these, and I have adopted a gift crate that costs very much less; they hold twenty-four quarts and twenty-four pints. The twenty-four quart crates I use in shipping strawberries, currants and gooseberries; the twenty-four pint are used in shipping raspberries; they are very neat and attractive and the fruit sells very much better when they reach the market, the fruit is all there in good condition free from dust or dirt. The question now will be where to find such a market as will best maintain prices, with this comes the problem of transportation which must be taken into account. The individual shipper is at the mercy of the railroad and express companies who without fear, favor, or affection for ten or twelve hours transit take not less then twenty cases out of one hundred of berries for their portion, while the commission man takes ten more. You can see what is left for you to pay for packages, picking and cultivation. The fruit grower has no subsidy to relieve him in protection from the extortionate freight charges. Can the fruit growers of Maine combine in their shipment to secure lower rates? I think they can if they all would combine together.

J. H. Hale—Certainly the subject of the afternoon that is laid out on your program here is one of very great interest and practically covers the whole broad field of commercial pomology, and any one of the subjects which you have here would take a whole afternoon. I haven't given it special thought for this time but there are thoughts upon it which I have rubbed up against in my life on a fruit farm, and I have some fixed ideas upon the subject of small fruit. "How to find the market." The best way to find a market is to produce something that the market wants, and put it up in a way they want it. Simply growing such small fruits as come up, putting the plants and bushes in the ground and giving them indifferent cultivation and indifferent food, and generally indifferent care, consequently getting moderate fruit of moderate size and quality and color and style won't find a market, or at least people won't go very far for that sort of fruit. The first and foundation principle of marketing lies in production. That is the first thing, to produce. But to make a broad, general statement, the wisest way to find a market is to produce something that the people want and to produce it a little better than the other fellow. When you hear laboring men, people of any kind saying they can't get along, and there is no place for them in this world, the trouble is they are not furnishing thoroughly and well what people want. The man who can do a common thing well, or can do it better than anybody else, is the man that is never out of a job, whether he is a hod-carrier or a blacksmith, or a carpenter, or a lawyer, or a preacher, or a doctor. When you hear of a lawyer getting tremendous fees, you may know that that man puts his whole heart and soul into his case and leaves no single little thing undone that he may develop that case to its utmost possibilities along his line. And everybody wants that man. And when the doctor does, and when the preacher does, and when the strawberry grower, small fruit grower does it and leaves no single thing undone to produce a little better fruit than the other fellow in every possible way, why he need not worry about a market,—not a bit. The market will find him, and find him pretty quick too.

After he produces it as well as he knows how, and a little better than anybody else if he can,—and we want everybody to each try and do more than the others—the more rivals we have in the business and the more men that can beat us the better off we are, it stimulates us to do better all the time and it broadens the consumption—then, further than that, grade your fruit, for it pays. It is more difficult to grade small fruits, for if you are going to grade at all it must be at the time of picking. To take them to the sorting house and attempt to do this is an injurious process to the small fruit. If the small fruits are to be graded, and if you are working for an extremely fancy market it will pay to grade your fruit, some varieties,—it must be done in the picking—you must pick extras into one package, number ones into another, and so on—and it will require paying an extra price to your pickers. You cannot get money unless you spend it. The more you scatter, the more things come back to you. The more you put into a thing the more you get out.

Now this fruit must be graded carefully, and to do it—in fishing for a very fancy market—you have got to pay a higher price than the average for the picking. You want your packages the newest, the cleanest you can get. We used to talk about ventilated packages, for our small fruits, especially. Years ago when I first began to grow strawberries and carry them to market—grew them on a little quarter acre patch—we put them in the little round boxes, perfectly tight, solid box, and put the cover on,—then put them in an old trunk and gave them to the stage driver and he took them to market, and the biggest dollars I ever saw in the world were what that old stage driver brought back from that little lot of strawberries. Then came the ventilated basket, and the ventilated basket and crate was talked about as a revolution in small fruit handling,—it gave them light and air and everything else. And we have drifted so far away that we have got into that ventilated package and we are ruining our fruit with too loose packages, too much air. I go to the grounds and they take me on top of the hill. Right on top of the hill they have got a little tent erected of boards or something else and it keeps the sun off and the air blows through there. They bring their fruit in here and spread it out for the wind to cool it off. But the air going through there all the time is ruining it. The quicker you can get fruit cool from the vine into a tight package the better. Your grocer down here buys some strawberries to-day. He does not sell them and to-morrow they look a little wilted on top and especially alongside of the fresh ones. He holds them until to-morrow afternoon, they have wilted down and look pretty bad and a customer goes by and won't buy them. What does he do? Just before Mrs. Brown comes round the corner he takes them and puts one basket over the other and turns them upside down and the bottom ones away from the air are bright and she buys them. Very soon the men who get the best market for very high grade fancy fruit are going to put them back into the absolutely tight package, but that means cooling them before they go in there. Don't go out in the heat of the day, or wet of the day, and shut them up there, but get them off the vines and cool and dry them as quick as you can in cold storage if you can have it, or something of the kind, and then put them in a tight package and they will keep. That is another way to find a market. Show them up to the people in the right way, make them attractive.

I can tell you a little incident in my own business. Some years ago, or a good many now, I am not so much of a kid as I look although in some ways I am all right—I went into the city of Hartford one morning with a large load of berries. I sold them and came back and got the second load, thinking I had got practically all. When I came home at noon I found they had picked five bushels more strawberries. What should we do with them? You know that is a tremendous lot of strawberries. I said "I will have to go back into the city with them." As I drove down by my sister's she came out and wanted to see one particular variety. She had a little bunch of roses in her hands and she dropped one in on top of one of those baskets of strawberries. Then a thought struck her and she said "Wait a minute and let me fix these up for you." I let the horse stand and went and got some strawberry leaves at her direction and she came out with a whole handful of roses. If you want a little tasty job, get a girl back of it. She just dressed those five crates of berries with a strawberry leaf and a rose on the top of each of the eight baskets on the top layer. I went to one store and another where I hoped to sell them, and then I went to the leading grocer. He said he had got more than he could sell any way. I said "Come out here, I have got some pretty ones I want to show you." He came out and lifted up the covers and used a great big swear word. He says "Golly, ain't they pretty! What do you ask for them?" "Thirteen cents a quart." He says "I don't want them, but they look so pretty I won't let them go." He bought the whole five crates and put them out in front of his store, they were pretty and they tempted him and they tempted his customers. When I asked him how he came out on that deal—"First rate, sold them all. I have never had such a big strawberry deal in my life."

Small fruit must be shown to the people and carried to them in the most attractive manner possible to catch their eye first. Then give them a good solid package full to impress them that you are liberal, and then have your package all right from top to bottom, and then just as good quality as it may be, and the market will take care of itself.

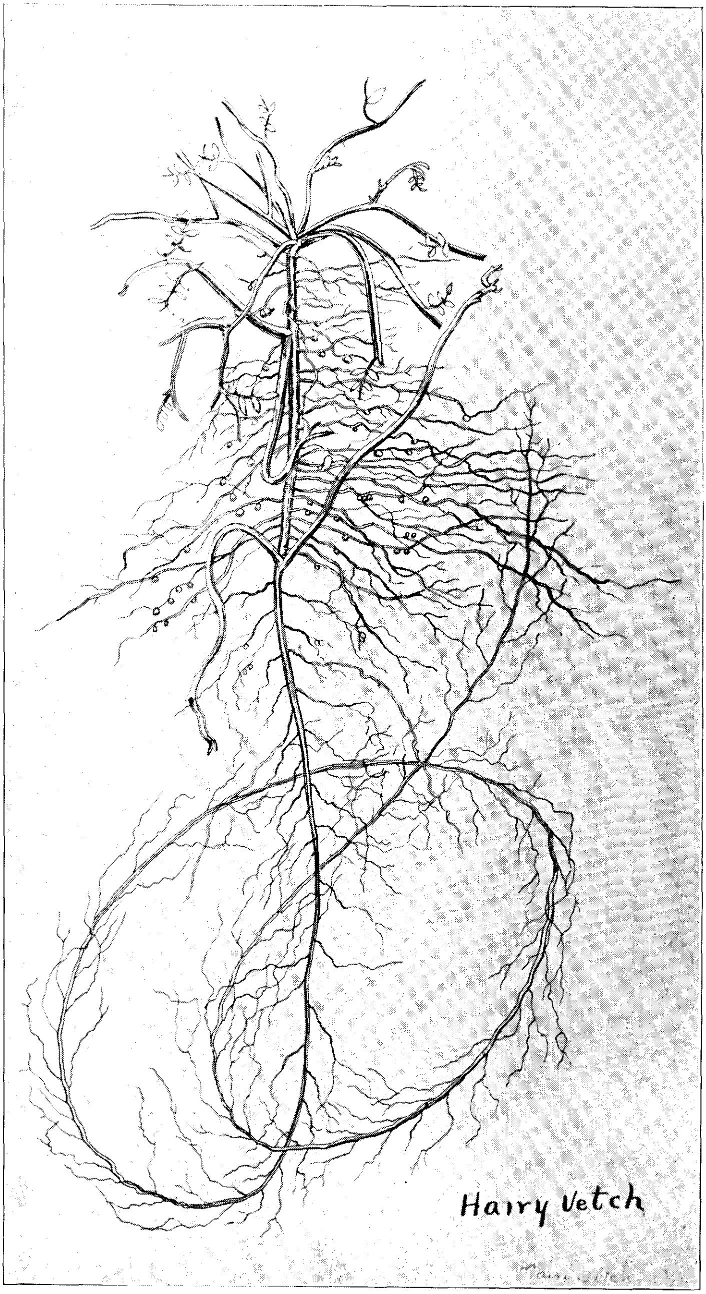
We need some sort of advertising. How the advertising shall be done, I don't know. I have a friend over in western Massachusetts starved out in the grocery business, went to growing fruits and getting rich; but he grows fruits better than his neighbors, he packs them bettter than his neighbors, packs them in a nice package, puts them up attractively all the way through, and then puts a little business card into every package, giving the name of his farm, the principal productions of his farm, the name of that particular variety of fruit, so that the buyers may know what they are eating—if they get something that is good they will want more of it—and across the bottom of that card what does he say? "Price always five cents above the market." Tells them right to their faces that his price is five cents above the average market right along, and yet they come to him every day as fast as he can supply them, and way over in western Massachusetts as far almost away from Boston as you are, yet he has a trade in Boston among the fancy retailers there who buy his fruit and pay him for it in his own station.

### HOW TO PREPARE FRUIT FOR MARKET.

How to prepare fruit for market—that depends upon the variety. In the first place, prepare it in the production, begin to prepare it for market when you begin to grow it. All these things lead right back into the ground, lead right back into the man or woman that is back of the job. You have got to have a heart and soul in it to begin with. You have got to believe in it yourself, and you have got to love to do it and then do it just as well as you know how.

The other end of it is to go to the market and find out how they want it. Go down and study the various markets. I have knocked about the United States a great deal in my time, in fact what money I have made the most of it is spent in travelling and going round and seeing what the other fellow was doing,—and I never stop in any large city or town over night but that I am out at market hours in the morning to study the market end of it—in New York two o'clock in the morning, in Chicago five or six, or four or five, and in Boston it is not until six o'clock—and I study the market and see if certain things are selling. Why did I say last night, pack your apples in boxes instead of barrels? Because my observation in the great markets was that a barrel of apples in boxes will sell for 30% more than the same apples in a barrel. I have found that from observation. That is why I recommend it. And I have found that people want certain kinds of fruit in certain kinds of packages and in certain ways, so that in a large measure you have got to conform to the demands of the people.

I know of a prominent grower in a neighboring state who shipped twenty barrels of apples to market, all packed together, good, bad and indifferent. They were not very badly faced on the top or bottom, but nevertheless they were a mixed up lot. When they got to market the best offer the commission man could get for them was $1.50 a barrel, but the apples were worth more than that. He wouldn't sell them to outsiders at that and he bought them in himself. He had a little leisure—those apples were bought in at $1.50 a barrel, twenty barrels, and they were resorted so that he got some eight or ten—I did have the exact figures—he got about eight barrels extra good apples which he finally sold for $3 a barrel; six barrels of good No. one, at $2.25, a shrinkage of one barrel, and the rest No. threes which he sold for $1 a barrel. He made about 30% on that lot of apples by putting a little common business honesty into the barrel along with the apples. Just as mean and dishonest as you may be at heart, the meanest old money grabber on the top of the ground—if you want to make money, be honest. If you want to make money in the fruit business, be honest all the way through every single package and in every detail. Be honest with the soil. Be honest with the tree and the plant. Be honest with the fruit in its handling all the way through, and then be honest with the customer at the other end of the line—because it will pay in dollars and




FROM DRAWING SHOWING ROOTS OF HAIRY VETCH.

By courtesy of Prof. John Craig, Cornell University.
See article on Cover Crops for the Orchard, page 57.

cents if you want to measure it by that low, miserable standard of dollars and cents. Put it on that ground, it will pay you better than any other policy.

### PACKAGE FOR APPLES.

Question. What is the best box for apples?

Mr. HALE: The best we know of yet is a box just about 22 inches long and about 10 inches deep, and 10½ or 11 inches wide.

Mr. KNOWLTON: About like the Canadian box?

[The Canadian box is made of ⅜ lumber and its dimensions are 10½x11½x21½ outside—cover and bottom narrower to admit of ventilation.—Secretary.]

Mr. HALE: Well, I think the Canadian box, if I remember right, is a little wider than that. You want a box with not too great a surface on the top for the heading, and ten or eleven inches seems to be enough. You want it pretty nearly equal depth and width so that in the cooling off process there wont be any long ways to the center from any point.

Mr. KNOWLTON: Do you have the box made open?

Mr. HALE: No, sir. Tight box, ¾ inch material on the ends, about ¼ inch veneering for the sides, bottom and top. I think it would be an advantage to make these boxes with a little thicker sides. The veneering sides spring a little and are apt to crush the apples; if the corner of one box strikes the flat side of another there will be some spring and bruising of the apple. While the apple boxes that have already been made are about ¼ inch material on the sides and bottom, and it will cost a little more to make one with ½ inch material, I think our best apples will carry better in a box with a little thicker sides.

Q. Do you recommend wrapping apples in tissue paper?

A. I would recommend wrapping in some sort of paper, I am not sure yet whether tissue or paraffine paper or something of that sort. What you want is to keep the apple away from the air. The apples will shrink. They will shrink in cold storage. I was talking with a gentleman yesterday on the question of cold storage, and as I told him, when I was a kid and used to go with the boys all round the neighborhood into every cellar to get apples, we always found the best and finest in the cellars that had wet bottoms, the damp, old cellars. We have been talking about a dry cellar as the proper place for apples, it has been advocated in our agricultural papers, but give me the wet one and I will keep an apple longer and brighter every time. So of cold storage, it is a question, I think, of which we know actually very little at the present time, They merely get a good cold room and put stuff in there and it will keep pretty well, but I think our cold storage rooms want to have some plan of retaining the moisture. If I had apples to store today in the average cold storage house in barrels, I should arrange to sprinkle those barrels twice a week as long as I kept the apples there. I would take my chances on their coming out better than any other apples in that storage house that looked equally well when they went in.

Q. Those boxes you spoke of will hold about half a bushel?

A. Made to hold just a bushel, 50 lbs. of apples.

Q. Most of them hold a little less than a bushel.

A. They are intended to hold a full bushel of apples, the California box is, and the Colorado box. We want a standard American box and a standard of grading. You want a standard that is made and maintained by your Pomological Society, so that when an officer of your society is willing to put his stamp on a barrel it my be known all over the world, it may mean something.

By G. Harold Powell, Agricultural Department, Washington.

I desire to add a few words in regard to the box as a package for the finer grades of apples. I have recently been in the land of the "big red apple" in Missouri and Kansas, and I found several growers, especially among the younger men, adopting the box for the better apples such as the Grimes and the Jonathan. Their box is much like the Colorado box of the dimensions given by Mr. Hale. They are made of white wood and are the most attractive and best formed box for the purpose I have seen. They cost about 10½ cents knocked down by the thousand. The top and bottom of the box bulge out when the cover is put on, but the boxes are stored on their sides so that no pressure comes on the bulge. The tops and bottoms and each side were made of one solid piece each rendering the package very attractive.

Apples need to be packed very tight in the box or they shake around in transit and bruise badly. I found one young man lining the boxes with a light tinted paper which set the fruit off effectively.

The ideal box is about as wide as it is deep and about twice as long as wide. A flat broad box shows the fruit off advantageously but it is objectionable in that too many fruits are bruised in putting on the cover. I have had some experience this year in the cold storage work of the Department of Agriculture with a pear box used in western New York. This box is made of ⅞ inch stuff for the ends and ⅜ inch for the sides and tops. It is 17 inches long, 16 inches wide, and 7 inches deep. I found this box very objectionable. It is too shallow to take three layers of good size apples or pears and there is too much fruit surface exposed for bruising when the head is nailed on. I had to fill these boxes from the narrow sides.

The box used in Missouri holds a full bushel, while this New York box holds but seven-eights of a bushel.

The Californians are using boxes extensively for their apples. Only last year the Pajaro valley shipped 1,000 cars of apples, of which 220 cars of Yellow Newtowns were sent to Europe. The box is the coming package for the finer apples and I would advise the Maine apple growers to give the matter serious attention.

One word about fruit wrappers. I had occasion to examine a lot of LeConte and Duchess pears in cold storage the day I left Washington. Part of the fruit of each variety was wrapped in a thin tissue paper, and an equal part was left unwrapped. The fruit had been in storage more than a month, having been picked and stored at the same time. The difference between the wrapped and unwrapped fruit was striking. The wrapped fruit was hard and bright, the unwrapped showed a distinct shrinkage, the fruit was not firm, and it had lost its bright glossy appearance. While we are not now prepared to say very much about the practice of wrapping, it looks as though it paid well to wrap the finest kinds of fruit either for the immediate market or for cold storage. (Figures were here given to show the value of wrapped Bartletts in comparison with unwrapped Bartletts in the London market. The wrapped fruit whether in barrels, boxes, or half boxes sold considerably above the unwrapped Bartletts.) The Department of Agriculture has this question under experimental study this year. It is using tissue, parchment, parafine and newspaper wrappers in the experiments with both pears and apples.

### TO WHOM AND WHEN TO SELL.

Sell to the fellow that wants them and when he wants them always. That is a good business rule to sell to the man who wants to buy real bad. After all, farmers, fruit-growers, the New England farmer particularly, is by force of circumstances a laborer, a business man and a capitalist combined in one. Nine times out of ten he forgets that he is anything else but a laborer. Nine times out of ten this laborer, this business man and this capitalist works so hard earning his little $1.25 or $1.50 a day that he forgets all about his capital he has got that needs looking after, and he forgets all about his business interests which need looking after, to guide his labor and to guide his capital that they may both give the greatest returns, and he does not look far enough out into the world about his market interests or the selling of his product. So that question of to whom to sell and when to sell is the business one, a knowledge of what other people are doing. Your society did a grand thing this year in getting out this little circular about your apples—the best money you ever spent for your society if your growers took advantage of it. The grower should be constantly on the alert to know what the other fellows are doing, what they are planting, how they are caring for it, what sort of production, where they aim to sell, why they succeed and why they fail, all these things. He should give constant attention to what is going on on the outside. Of course the man with a dozen apple trees, fifty or a hundred can't spend a thousand dollars travelling round the United States, but he can get in touch with other men in different sections of the United States, keeping in close touch with the Pomological Division of the Agricultural Department at Washington. They will freely answer your questions. And keep in touch with the secretaries or the live men, members of the different horticultural and pomological societies. If the secretary himself hasn't time to correspond with you, say, who is there in this society that keeps his eyes open and is willing to talk a little? You can find in every state in this Union commission men. They know where all the apples and peaches are long before they are ripe. They know the condition of the fruit crop all over the country, because it is their bread and butter, but it is bread and butter and pie to the grower if they only knew it and what Yankee don't want pie? A dead one is all the one I know. And so it comes that we need a knowledge of our business, and when we get that knowledge we shall know each for himself whom to sell to and when to sell. But we can't have any general rule that we will all sell to Boston and that we will all sell on the 17th day of November,—not at all. We want the knowledge of marketing conditions, and productive conditions, and climatic conditions, and then apply that knowledge each for himself and to himself and by himself, or through an organization if you will, but in a general way we need all that in our head. That is where the money is made in your business. That is where the success comes in your business. Main strength and awkwardness is at very low premium everywhere. Brains, intelligent brains that may be well directed in any business are worth money, and they are worth just as much in agriculture and just as much in horticulture as anywhere else. I believe myself, as one who was born on a New England farm, and has lived all his life on a New England farm, that the business of agriculture today rightly managed in New England will pay better dividends than any other business in New England today.

And I say to you now, and I say particularly to you fathers and mothers who have got boys coming up, if you will impress upon them what there is lying locked up in the good old soil of Maine today, and show them the opportunities of New England agriculture, show them the opportunities that may come to them through these societies and through the work of the Grange, and through your agricultural press and through your college over here at Orono and your Experiment Station, they need not go to New York, Boston, or any of the large cities to make a living, they can stay right here on the farm. And a man can get a lot of fun that he can't get anywhere else, the enjoyment that comes from working with trees and plants and the soil and with Mother Nature, providing your mind is open to receive it. I know some people don't see that. They don't get the pleasure out of it, the glorious enjoyment of working with these beautiful pictures on this table, and the trees that grow them, and the little plants that grow out of the soil. All that has a wonderful joy in it if we are big enough and broad enough and deep enough to hold it all. We shut our eyes to too many things, we farmers who live in the country.

### THE BIGGEST PRICE—HOW TO GET IT.

In a communication to the secretary Messrs. Hall and Cole, well known commission merchants of Boston, write some trite suggestions that should be carefully read by Maine fruit growers:

"Of course we have a pretty thorough knowledge of our end of it, and referring to your question, 'The biggest price—How to get it?' would state, that one who has nice apples, handles them through all the stages of harvesting and packing, in a faithful manner, sorts well, and 'faces' so that when a barrel is opened, the face is an indication of the balance of the barrel, not all large, or all small, but a sample of its contents, who faithfully packs nothing but hand picked fruit, and does not allow himself to put in a barrel a 'drop' apple, even if it is the best one on the tree, fills barrels solid, so that they will arrive at market in like condition; and can be depended on to do this, is the grower who gets 'the biggest price.'

"We have growers on our list, who have placed their goods in our hands for forty years, or more, who always do as we have stated above, and we have a trade that buys these apples year after year, and does not ask to have a barrel opened—*they know the goods.*

"We know many growers, who are faithful in every detail of handling their apples, but might mention Mr. Phineas Whittier of Chesterville, and Mr. Charles S. Phinney of Standish, who know how to do it, or have it done.

"A word to growers, who send their goods to market in small lots. To meet with the best results, each barrel should be marked as to what it contains, variety, and quality, and in case shipping stencil has not been furnished, name of shipper appear on each barrel, and in shipping, advice of shipment should be mailed at once.

"This is important. It is surprising how many neglect the whole or some part of this advice. Perhaps one-third do not advice of shipment, fifteen per cent do not state a thing on the barrels, but name of consignee. Perhaps someone makes a shipment of five barrels, and nine others do the same, from as many different places; they reach Boston; unloaded, and mixed together; come to market; buyers ready to purchase; but just what is at hand to sell cannot be determined, only by opening each barrel, and that is impossible. Result—some of the goods may not have full justice done them, but if attention was paid to the advice, there would be no mishap."

## COVER CROPS FOR THE ORCHARD.

By G. Harold Powell, Washington.

Illustrated by Stereoptican Views.

One of the finest features of the pomological meeting is the large attendance of the ladies and in the evening session of the boys and girls. I am delighted to see the gallery crowded with young people. In a few years they will be occupying your places on the main floor and no effort on your part to encourage their sympathy with rural life and its manifold activities now can be too great. I heartily wish that I had not committed myself to a subject for this evening. I would consider it a privilege to address my remarks wholly to the younger people and to endeavor to stimulate their interest in the different forms of nature around them. Apples and peaches and pears and plums and soil management are all right, but the best fruits of the Maine farm are the children that grow there.

In the older sections of the country where crop rotations have succeeded each other generation after generation or where similar crops have been under intensive cultivation for a long continued time, there is a constant diminution of the vegetable matter of the soil. The orchard soil that is tilled once or more a week for several years, and in which no provision is made for replacing the vegetable matter that burns out, grows heavier and "deader," with smaller water holding and less productive capacity. Good tillage wisely guarded increases the productivity of orchard lands, but intensive tillage has its accumulating effect for evil unless its operations are thoroughly understood.

It may be well at this point to briefly review the primary objects of orchard tillage.

First, it makes the soil fine and loose and favorable for the growth of roots. A crop cannot grow on a stone wall nor on a bank of stiff clay, yet either may contain as much mineral food as a rich garden loam. The soil must be fine, and open, for the highest development of plants.

Second, it acts as a dressing of fertilizer, as it helps liberate the unavailable plant food. I imagine that every acre of land in Maine is rich in potential plant food which only needs to be awakened for the use of the plants growing on it. An acre of soil may contain from 5,000 to 30,000 pounds of potash, and from 2,000 to 8,000 pounds of phosphoric acid in the first foot, and I imagine that there is not an acre of Maine soil that will not exceed the minimum figures in its native fertility. Exhausted soils! Where are they? Abandoned farms whose fertility has been exhausted! Their plant food is only locked up and the key thrown in the well by those who have abused them. They need working. They need vegetable matter and a rational system of agriculture that does not burn them out.

Tillage then helps liberate plant food, putting the soil in condition so that the chemical activities and the biological activities within it can progress more rapidly. One of the most emphatic problems in modern agriculture is how to get these stores of plant food out of the soil, rather than how to buy them in the form of commercial fertilizers.

Third, it acts as a continuous gentle irrigation in that it prevents evaporation. Tillage prevents evaporation by making the surface layer coarser than the underlying ones, putting the soil in condition so that the chemical activities and the biological surface layer coarser than the underlying ones. The water rises by capillary attraction until it reaches this coarse layer of soil where it is held, and a rational system of tillage is one that continuously preserves this soil mulch.

And fourth, it kills weeds. This last function has been the principal reason for a large part of the tillage of the past. Blessed be weeds!

Soils are made up of a number of mineral elements formed by the disintegration of rock and of organic materials such as leaves and sticks and stubble and the roots of plants. This organic matter is essential to a fertile soil but its content is constantly reduced by long continued cropping and cultivation unless some means is provided for maintaining the supply. Soils that are lacking in vegetable matter are burned out and dead. They are inactive. They hold a small amount of water, and they lose that quickly. I desire therefore to impress upon you the need of supplying vegetable matter to your orchard lands, and that brings us to a discussion of the subject of orchard cover crops. A cover crop, as the term is understood in horticultural language, is one that is sown in the orchard after the trees have made their annual growth and is allowed to remain there until the land is plowed the following spring. The cover crop has several distinct offices to perform besides supplying vegetable matter to the soil, and to these functions I desire briefly to refer. The cover crop idea for orchards is distinctly a modern one and has grown up since the intensive cultivation of orchards has come into prominence.

The most expensive and the most illusive element of plant food is nitrogen. In the condition in which plants use it it melts away like sugar or salt. Growing plants take it up and use it in their growth, and on soils that are barren of plant life, the nitrogen is lost in drainage water. The greatest loss of nitrogen occurs through the fall and winter months, and a distinct function of the cover crop is to take up the available nitrogen at that period of the year, and to hold it for the future use of the orchard. The cover crop also takes up other available plant food during the fall and thereby assists in checking the growth of the fruit trees which harden down or ripen their fruit buds more satisfactorily. This latter point is one that cannot be too strongly emphasized in the colder fruit growing sections of the country.

The cover crop keeps the soil open so that the fall and winter rains, instead of running off into the streams, sink slowly into the ground, and, by its mechanical action, it prevents the washing and compacting of the soil.

If the cover crop is one that lives over winter it pumps out the water of the soil in the spring sometimes hastening the period when the land can be plowed from one to two weeks. I desire to emphasize this water exhausting power of the cover crop in the early spring, for sometimes when the succeeding months are dry, the early growth of the cover crop may have wrought a serious injury to the future orchard crop. Have seen both corn and tomatoes that were a partial failure after following a heavy growth of crimson clover that had pumped out tons of water in its spring growth. I am firmly convinced that the practice of allowing cover crops to make a large growth in the spring before they are plowed under is a serious mistake. I base this conviction, first, on the fact that a fruit tree should be forced into rapid growth early in the season so that it may largely complete its growth in the north by the first to the middle of July and have a long fall for ripening its buds, and, second, because a rapid, early growth and a slower growth in late summer is more conducive to the formation of fruit buds than a growth that is rapid when the fruit buds are beginning to form, and, third, because every effort should be made as early as it is practicable to plow the land to conserve the moisture that has accumulated during the winter months.

I would call your attention to the following figures given by King. (The Soil, p. 191.) On May 13, the moisture was determined in a soil just planted to corn and in an adjacent clover field, the samples being taken within two rods of each other.

| | 1-6 in. Per cent. | 12-18 in. Per cent. | 18-24 in. Per cent. |
|---|---|---|---|
| Corn ground | 23.33 | 19.13 | 16.85 |
| Clover ground | 9.59 | 14.75 | 13.75 |
| Difference | 13.74 | 4.38 | 3.10 |

These figures illustrate the evil effect of allowing a crop to grow too late in the spring when the ground is to be used for a subsequent crop.

And now we come to one of the most important offices of the cover crop. It supplies the soil with vegetable matter when it is plowed under. I have already stated some of the relations of vegetable matter to crop production, but the subject is of sufficient importance to justify a repetition. Humus or vegetable matter gives a soil a greater water holding capacity, and it accelerates its chemical and biological activities. Of this latter point I desire to speak briefly. The decomposition of the mineral matter of the soil and the decay of its vegetable matter is caused directly or indirectly by millions of little organisms called bacteria living within it. A mass of soil is not a dead inert body. It is a storehouse of the most wonderful living activity. The bacteria within it thrive and multiply and perform their work only under the most favorable conditions. Plant food is made available through them. Air and light and moisture are essential to their life, and if we should follow the problem to its ultimate analysis the most desirable system of land management is that which provides the most desirable conditions for the multiplication of soil bacteria. I wish to state several propositions that bear upon our orchard work, regretting that there is not more time to discuss them. First, in cultivated soils the number of bacteria is larger in well cultivated soils than in uncultivated soils; second, the number of bacteria increases with the amount of organic matter or humus in the soil, and, third, an increase in the number of bacteria means an increase in the available supply of plant food.

We have said that the cover crop increases the water holding capacity of the soil. It makes it sponge like. The statement is probably conservative when I state that fruit crops suffer oftener from dry weather than from lack of plant food. There is probably not a fruit grower in the room whose apples or other fruit crops have not been reduced in volume by dry weather. Yet if the soil had been prepared to hold a large amount of water, and if the winter rains and snow had been conserved by judicious tillage, it is probable that, in nine years out of ten, a fruit crop could be kept in a vigorous growing condition in the droughtiest times. It has been well said by Bailey that the people in the dryest sections of the country suffer least from drought. They catch all the water they can, and then hold it in the soil.

To illustrate the effect of turning under three cover crops on the water retaining capacity of a soil in a dry spell the following figures are taken from moisture analyses made by Cornell University:

Soil in which three crops clover had been turned under had 15% of moisture in July. An adjoining soil with no crops turned under had 8.75%, and lastly, the cover crop, especially if a leguminous one, furnishes nitrogen to the soil, through the bacteria that live on the roots of the plants. The time will not allow us to discuss this phase of the question further than to say that every pound of nitrogen used in the ordinary fruit growing operations can be supplied free of charge by leguminous crops, turned under, in the form of cover crops.

There are two general kinds of orchard cover crops, first, leguminous crops or those that can make use of the free atmospheric nitrogen through the bacteria on the roots of the plants.

This class includes the beans, peas, vetches, and clovers; and second, non-leguminous plants, such as oats, rye, buckwheat, rape, turnips, and salt bushes.

These crops may be sub-divided further into two kinds, first, those that die after a few fall frosts like the beans and peas, and second, those that pass the winter and begin to grow in the spring like the clover and hairy vetch.

(Mr. Powell then illustrated a large number of cover crops by lantern slides discussing the merits and demerits of each one. The crops he thought best adapted to Maine were the cow peas and soy beans for the coarser lands and following them the hairy and spring vetches, alfalfa and crimson clover. The cow pea, soy bean and vetches are especially valuable on land that has not previously been sown in cover crops, while the crimson clover and alfalfa are at the top of the golden chain of cover crops and require the finest preparation of the soil.

Of the non-leguminous crops rye, rape and cow horn turnip were strongly recommended. The speaker also discussed the advantage of mixing several cover crops together like crimson clover and cow peas, clover and vetch, or clover and turnips. The coarser crops shades the clover which usually makes a strong growth during the late fall months.)

## FRUIT AND FRUIT CULTURE.

By J. H. HALE, South Glastonbury, Ct.

I have not come here with any fixed lecture in mind, with any prepared talk, but just as one fruit grower to another I will talk to you a little while on some of the subjects that interest us all. The first one is this question of fruit that is here before us, and did you ever think that of all the choice food products that God has given man, that come to us from the farm, fruit is the only one that comes to us ready finished as palatable and wholesome food without any other manipulation or preparation? It is in its best possible condition, and no amount of cooking, no amount of witchery of any sort that the housewife can put upon it can improve it. Now all of our other food products have to go through some cooking process, some butchering process, some more or less great amount of work before they are fit for food of men, but here is one good product that is ready without any such expense, and that is an item to be thought of; and while fruit a few years ago was considered a luxury, people are finding that fruit is one of the staple articles of food the country over, and people are using fruit three times a day upon the table and a dozen times a day between meals if they can get it, and are saving a great expense and a great amount of work, and above all are adding to their health. This idea has been caught on to by men who are interested in fruit culture, men who must make a living out of something, and the planting of fruit in the United States of America to-day is something enormous. In my own fruit growing industries both north and south I have had to look into the fruit growing of other sections of this great United States, and it is astonishing the rapidity with which acres and acres, and hundreds and thousands are being planted in every section of our country. A few years ago Delaware and a little section of Michigan were considered the only peach regions in the United States and now Connecticut, my little state of Connecticut, grows more peaches than Delaware. Peaches are now practically grown in every state in the Union and immense tracts are being planted in Georgia, Alabama, Texas and Missouri. I know of one concern that is to plant out more than 2,000 acres in Texas this coming winter. And so it goes over into Missouri, and parts of Kansas and Nebraska, Colorado and over on to the Pacific coast, apple orchards are being planted in similar way. In the Ozark region of Missouri, sections of southern Iowa, eastern Kansas, Nebraska, Colorado and New Mexico, and up in Oregon and Washington and Idaho, besides California, they are planting apples by the twenty and the fifty and the 200 and the 500 and the 1,000 acres. Grapes and plums and pears are being planted in proportionately large areas.

When I go about visiting the people who own large orchards in the central west and the far west and the far southwest and the south and meet the owners of some of these large plantations, and they show me about, show me their packing house facilities for shipping, their cold storage and the way they handle their crates and packages and all that sort of thing, the first question comes, where are you going to market this fruit? And while they expect to market a portion of it locally, or in near by states, the general agreement is that all of the fancy and thoroughly first-class fruit is to be shipped north and east, which means east of the Mississippi river and north of Mason's and Dixon's line. A little further questioning develops the fact that for their very choicest markets they are looking to the northeast corner of the United States, New York and New England, close where your farm and mine are located. What is the matter with you and me that we are not planting more orchard fruits to supply these markets right at our door? If these people five hundred and a thousand and two thousand miles away can invest their capital and their energy in producing these fruits in large quantities and expect to make dividends on it after they have paid one, two, three or four hundred dollars a car to get it into the very markets where your farm and mine are located, is there not something in it or more than something in it for you and me who are here on the ground and can leave our fruit on the tree, plant or vine until it comes to almost perfect maturity? It seems to me so. It seems to me that we are lacking in something, that we have not fully awakened to the opportunities that are before us.

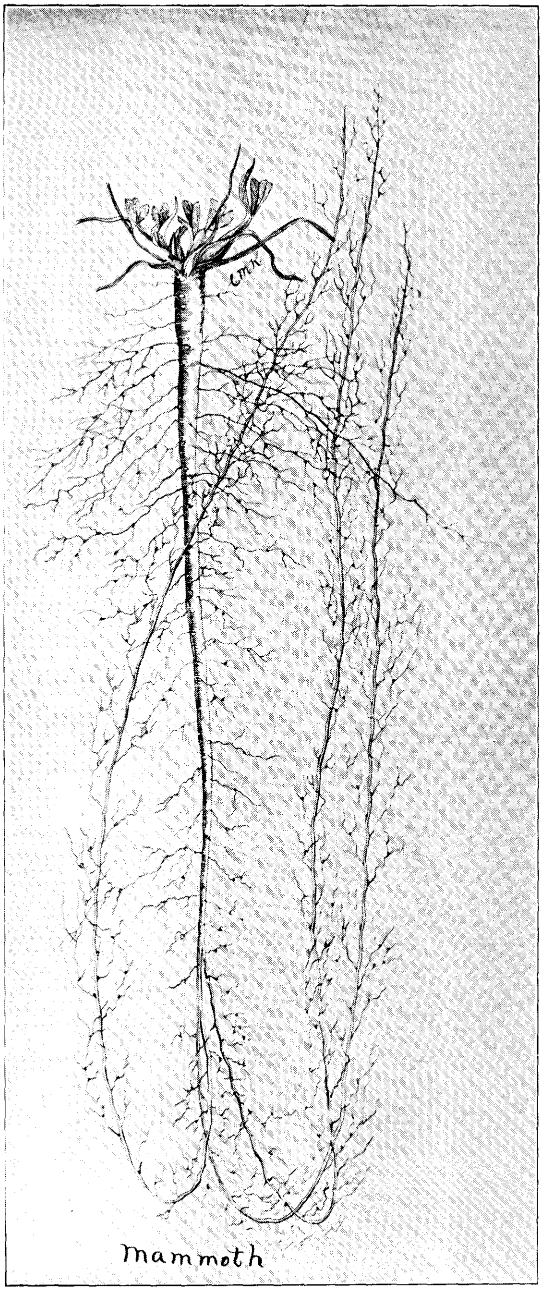
We land owners who live right close to these markets and take no interest in these great questions of fruit industry, and fruit marketing and fruit supply, are dead to our interests, and we need waking up and a most thorough waking up. Why for years the people in the west, every railroad in the west has been waking up to this proposition. You who have been to Kansas City will remember the sign right across the way from the big railroad station, at night lighted up with electric lights, which reads: "Come to the land of the Ozark, the land of the big red apple." It has been advertised in magazines in this country and in foreign countries "Come to the land of the Ozark, the land of the big red apple," and you people of Maine have kept still when you might have hollered a great deal louder, "The State of Maine, the land of the big and the good red apple." What is the matter that you have not advertised it on the house-top and all over the world?

The best markets in all the world are in New England or very close to it, and the next best markets are right across the water, where we have ferry boats running at frequent intervals. The men who are fishing for foreign markets must come right in by your door to reach the seaboard and then go across, and they have to pay a great big tax to the railroad when you and I don't.

In and around the city of London there are more than six million people who must buy all the food they consume, and as a very large measure of English food products are imported, the farming lands of the eastern United States are nearer to them than any other lands of cheap production in the world. It is a wonderful opportunity for us not only in our fruit products but many others, and if we fail to take advantage of it, it is our own fault and not the fault of the situation. Now as to our own eastern markets, as I have said before they are the best markets in the world and we are the nearest to them of any fruit producers in America. It gives us an opportunity to develop our fruits upon the tree, plant or vine to their highest perfection and then market them quickly. These eastern people not only have a taste for and appreciation of our fruit, but have an ability to buy that is not equalled by any people on the face of the globe. The recent census shows that the deposits in New England savings banks are far greater than in any other section of the country, and the increase in deposits for the last five years has been greater than in any other period of fifteen years. We can have our share in this money if we only will.

Let me tell you a little thing that came out of the World's Fair at Chicago ten years ago. How many of you brought home the business idea of that fair to Maine? There were millions in that fair for the State of Maine if there was anybody smart enough to have brought it home in their heads. As you all know, the various states made plans for the apple exhibit by having the fruit put in cold storage the fall prior to the fair, and later it was sent to the permanent cold storage building on the grounds, so that there was fruit at hand day by day to replace any specimens that failed through decay or other means of loss. Friends of mine who visited the fair in May and early June came home and told of the wonderful apple exhibit of some of the far western states and the southwest and said that New England wasn't in it at all. But early in July a great fire destroyed the cold storage building and then the fruit from every section of the country had to stand or fall on its own merits, as there were no specimens to replace the daily decaying ones. In a few short weeks practically all the apple exhibits were wiped out except those from the northeastern corner of the United States, showing that our apples have keeping and staying qualities superior to those from any other section in America. There was millions in that little idea if Maine had got hold of it. It is a point of tremendous value, and is going to be more so in the future as the demand for good all-the-year-round apples is steadily increasing. You have the soil, you have the climate, you have some of the finest apples, you have thousands and thousands of acres that will produce as fine fruit as can be grown anywhere on earth, and all it wants is men and women who have faith in themselves and in the business to practically apply culture on an extended scale. No amount of hard work will win the highest success. Men work too hard but they think too little. If I was a preacher and was going about to preach to farm audiences, I would take for my subject "judicious laziness," and I would preach to the farmers to be judiciously lazy. Don't work so hard that you haven't a rested brain that can think and plan about your business.

I want to emphasize the fact that our fruit growing cannot be very successful without the most thorough tillage of the soil and thorough preparation of the soil, and to show what it does on land, on good land and poor land, I want to cite an instance from the wonderfully fertile soil of the Sacramento valley of California. I went there some years ago to visit the great farm of Gen. John Bidwell, whom some of you voted for perhaps for




FROM DRAWING SHOWING ROOTS OF MAMMOTH CLOVER.

By courtesy of Prof. John Craig, Cornell University.
See article on Cover Crops for the Orchard, page 57

President of the United States on the Prohibition ticket some years ago, a grand good man and a fine farmer. He has a farm of 40,000 acres. Besides fruit he grows a good deal of wheat and the fields are plowed with eight gang plows which turn over hundreds of acres daily. This is seeded to wheat and hurriedly harrowed in with broad, sweeping harrows that cover twenty-two feet every time across the field. Business is done on a very extensive scale. Right adjoining his farm there is a widow who has a farm of 500 acres, land practically identical with that of Gen. Bidwell, but as she has not the money or the machinery, this land is thoroughly well plowed with a two-mule team and a modern steel plow, and after lying fallow a couple of months is again cross plowed and then thoroughly pulverized over and over again with cut away harrows, after which the seed is applied and it is thoroughly worked into the soil, which in this way is far better tilled and prepared than the adjoining land of Mr. Bidwell. The result is that year after year, while Gen. Bidwell's yield is about fifteen bushels of wheat per acre, that of the widow is from thirty-three to thirty-five bushels, more than doubling the crop simply by tillage alone.

Everything depends on culture. Every year the public is demanding better things, finer berries, larger and more beautiful plums and pears and peaches and apples. The only way to bring them to their most perfect development is through thorough and frequent tillage of the soil, which keeps the trees steadily growing all the time by furnishing the necessary amount of moisture and by freeing what plant food there is in the soil by constantly bringing new particles of earth in contact with one another.

I was down in northeastern Massachusetts two or three years ago, talking to an institute there, and one man there said he had recently planted out a hundred peach trees to please his wife, but as he hadn't much faith in their ever bearing peaches he had seeded the land down to grass so he would be sure to have one crop any way. Surely such an orchard as that has "gone to grass" at the start. Coming up on the train today, all the way from Boston I haven't seen a cultivated apple orchard, and I suppose that more than 90% of the orchards in your state are in sod. You get many and fine apples in this way, but you could get more and better ones and more frequent annual crops, by thorough cultivation.

Next to thorough cultivation, intelligent and careful pruning is one of the essentials to successful fruit culture. To give a thorough talk on pruning would require one whole session of your society and I can only hint at it now. The question of pruning is a local one, depending upon the tree itself, upon the soil it is in, and what you want to prune for so that no man can lay down any definite rules of pruning, only the broad and general one of doing some pruning every year, pinching a little here and getting it that way, and a little there and getting it the other way, a general training up instead of letting it grow at will and finally putting it in jail to reform, that is giving it an everlasting slashing once in four or five years. The pruning is for several purposes. One is to let sunlight in upon the fruit.

The next essential to fruit culture, it seems to me, is thinning the fruit. If you plant a tree in soil prepared as well as possible, and prune it as we ought to year after year, when it comes in bearing it will be inclined to produce too much fruit, and therefore a thinning off of a large proportion of whatever may set on the tree is absolutely essential to the production of fine fruit. This question depends largely on your courage and your knowledge and on your wants, but as a general proposition, every tree develops from two or three to ten times as many fruit buds every year as it ought to develop in fruit. If the first time it comes to bearing,—take an apple for instance,—I may be treading on dangerous ground,—but taking an apple, when it has got to be five or six or eight years old, according to the locality, it will bear its first fruit. If it should set forty apples the first year, take off thirty apples and leave ten well distributed over the tree. The chances are that the next year it will produce a hundred, and if it does pick off seventy-five. The following year it may attempt two hundred. If it does, pick off a hundred and fifty, because the seeds in that extra amount of apples will sap the vitality of the trees and you want to get the tree into annual bearing.

Here is a point you are going to differ on. Some will say, "I would like to see a man make Baldwin apples bear every year." But if a Baldwin apple or any other apple is brought up in the way it should go and the fruit is thinned from the start and it is never allowed to overbear, it is nineteen to one in favor of its bearing annually. The trouble is you let the tree, the first time it attempts to bear, produce all the fruit it can grow and the strength of that little tree is taken in developing the fruit, the whole strength is gone into developing the fruit and none is left for bud making. The next year, having no fruit, it has got plenty of time to overdo itself in the line of bud development. I want to state right here at this time that there need not be any "off years" in apples except the tree is growing on the land of an off man. That is a broad general proposition. There will be occasionally failures from conditions that you cannot help, but six years out of seven you can have annual crops of apples if you will. By thinning you increase the size, beauty and quality. The quality of the fruit is very much superior when a moderate amount is distributed all over the plant. So with all kinds of fruit,—you increase the quality, you increase the size, you increase the beauty,—consequently you increase the value.

When fruit has been grown to its best possible development through culture, feeding, pruning and thinning, then comes the question of spraying. Spraying is practically as much of a necessity as culture or pruning. The man who plants an apple orchard or an orchard of almost any kind today and does not plan to spray the trees at the right time is taking a tremendous chance of loss. It is essential that this should be done. Of course you know as much about that as I do, and if you don't the Experiment Station can tell you in detail. It is thoroughly explained in their bulletins.

After the fruit is grown the question comes up of packing it in packages most suitable for the market, and there is where we often miss it. We have missed our opportunity, it seems to me, in this country to reach the consumer because we do not have our fruit put in packages of convenient size. I got a tremendous lesson this last year. There were two Belgians over here, bright young fellows, graduates from a university, who had some means and were looking for a new country and new opportunities. One of them was an engineer and the other had some other profession, but they came over to look America over and see what the opportunities were for young men of brains and energy. They travelled up and down this country for five or six months and they became interested more and more in fruit. They were astonished at the consumption of fruit by the people of this country; they were astonished at the difference that was paid for fine fruit and inferior fruit, and they looked the question all over and finally decided that the opportunity for the fruit grower was the greatest of anything for any man in America. There was no profession or business that they could see in America that offered such splendid rewards for brains as the culture of fruit, and they visited various fruit growers. One point they made to me in regard to the apple. They said they could go to the fruit stand and pay five cents apiece, but they wanted to buy a package as they came from the grower, and it was a great big barrel, and they said, "Why don't you put up the apple in some package that a man can buy and take home and take to the hotel?" Another thing these men criticised was that there was no adequate distribution of the fruit. There would be good fruit in one city and a hundred miles away but very little.

What are we doing about these things? What are we planning about these things? These are questions that want to be thought out. Somebody in Maine has got to begin to do something about this question of apple packages. In the large cities, where the people live in flats, they never think of buying a barrel of apples because there is no place to put it, but they would buy a barrel in four packages or three, and they would find a place to put it and use it up quickly and want more. You could double the consumption of apples in this country right away, perhaps not for the first year or two, but in a very little while, by giving a package that would go into the home. Then cram the package just as full as you can get it. If it is supposed to be a ten-pound package, get in ten and one-half pounds of fruit if you can. Pack it just as full as it can be crowded. Pack it honestly all the way through from top to bottom. If you have one single imperfect specimen to go into the package, put it on the top, imperfect side up. Put a label on top with your name on it, and let them know who does business in that way, and then make them pay for it, pay big for it,—they will be glad to do it. Every farm ought to have a name and a reputation. Every farmer ought to have a business sign up in front of his farm, giving his name, the productions of his farm, and the postoffice address if necessary.

But if you have to ship your fruit away, ship it to a commission merchant who knows how to reach customers in a wholesale way better than you do. Talk about dishonest commission men is all rot. I know commission men and I know farmers, and there are more honest commission men than there are honest farmers as a matter of fact. They simply know more about the ways of the business world. A man who is honest is honest because it pays. Nothing in the world pays like telling the truth. Decide on what market you want to supply and supply regularly. Go to the commission man and have a heart to heart talk with him and tell him what you are going to do and how you are going to do it, that you are going to have clean packages honestly packed and that when he finds your name on top it is a guarantee that he can stand by; talk to him until you convince him, and if you can't, go and see the rival across the way. They all want that sort of thing. Invite him to come and see your farm; take him out in the field and show him what you are doing; get him in sympathy with you and your business. Some one has said very foolishly and unwisely years ago that "there is no friendship in business." Don't you believe it. There is friendship in all good business and the best business is that which is based upon trusting friendship between buyer and seller, between commission man and producer. So get your man into real sympathy with your business. You must be in sympathy with it yourself; you have got to be thoroughly interested in your business to succeed.

E. W. Wooster.

Q. Which do you consider the more correct method of fruit improvement, by bud variation or seed?

A. By seed for new varieties, and by bud variation and selections from most valuable specimens of standard sorts great improvement can be made.

Q. In strawberry culture, do you advise fall and spring applications of fertilizer on plants that are to fruit that spring or summer?

A. Not for the purpose of developing more fruit buds or root power, but perhaps to aid the production of a somewhat greater foliage such application may be advised on weak foliage varieties.

Q. Have you ever tried the experiment where you have applied fertilizer during the whole season, all that the plant could possibly take up, and then put on more in the fall or early spring, and then noticed the results carefully of the extra amount?

A. I have never tried it in late years because I think I know better for my soil and the varieties I grow mostly for market.

Q. Will you name a half a dozen of the best strawberries?

A. For general purposes over a wide range of country, Glen Mary, Haverland, Splendid, Sample, Clyde, Mammoth and Dunlop are undoubtedly the best now known.

Q. Please name several of the best plums.

A. I prefer the Japanese plums, a new race of fruit that has come to this country recently. They are as productive as cider apples, as pretty as "the best girl"—they come early and medium and late, and they go through a large range of color—Red June, Abundance, Chabot, Burbank, perhaps represent the cream of them. For this cold north country, Hale is highest in quality, Wickson largest and Satsuma best for canning.

## MAINE FRUIT AT THE PAN-AMERICAN EXPOSITION.

W. M. MUNSON, Orono.

Most of you are aware of the history of Maine's Pomological exhibit at the Pan-American Exposition. At the winter meeting of the society held at Norway in November last, it was voted to appropriate $250 for the purpose of showing Maine's fruit and later the legislature granted $250 more. So the total sum available for collecting, installing and maintaining and exhibit was $500. With this fact in mind I trust that censure will not be too severe when our exhibit is compareed with that of New York, Missouri or Illinois—especially when it is known that these states provided from $10,000 to $15,000 each for a like purpose.

The collection of Maine's fruit was begun so late in the season that it was difficult to obtain all of the varieties desired and much of the finest fruit had already been shipped. The officers were therefore compelled, in many cases, to depend upon the open market for their supply and only the late winter varieties were represented. Some of the fruit was too small and poorly colored for exhibition and was rejected; but in general it opened up well and was typical of Maine's commercial orchard product.

A word as to how the exhibit was collected and forwarded may be of interest. Mr. Pope, treasurer of the society, was authorized to invite contributions of fruit, and many growers responded generously. It was necessary, however, to purchase several barrels. The fruit was sent to Augusta where it was carefully re-packed, each individual fruit being wrapped in two thicknesses of paper—the one next to the fruit being usually waxed paper. It was then placed in the warehouses of the Buffalo Cold Storage Company and kept at a temperature of 34° until desired for the tables.

In response to a telegram from Secretary Knowlton I went to Buffalo on the 10th of May last to make necessary arrangements for installing the exhibit. At that time the only exhibits in place were those of California and Connecticut. The hall was in confusion and it seemed impossible that order could be brought out of the chaos in time for the formal opening on the 20th. As a result of constant effort, however, when the time for formal opening arrived, besides the states already named, Delaware, Illinois, Maine, Michigan, Missouri, New York, Oregon and the Province of Ontario were able to make creditable displays. After that time Washington, Idaho, Virginia, Nebraska, Wisconsin, Minnesota, Florida and some other states came into line, and Horticultural Hall finally presented a very attractive appearance. The building itself is a beautiful structure 220 feet square and from the two corners nearest the main esplanade are large conservatories which connect the horticultural building with those devoted to Mining and Graphic Arts respectively. On each of the four sides is a wide entrance and the broad aisles intersect under the central dome. At the intersection stands a large statue of the Goddess of Light, made from the same model as that of the famous electric tower. Around this statue are grouped numerous cocoanut palms and banana trees which were brought from Florida. The larger portion of the western half of the building was given up to California, Missouri and the Province of Ontario; while in the eastern half New York, Illinois, Oregon, Washington, Florida, Michigan and Mexico occupied most of the space. Delaware, Virginia, Idaho, Minnesota and some of the other less extensive exhibits occupied space along the wall adjacent to the larger exhibits. Maine occupied a very advantageous position on the west side of the north entrance and just across the aisle from Missouri. The space was not large, but it was the best available at the time the exhibit was decided upon.

About 100 square feet of floor space were occupied and, considering the circumstances, the location was all that could be desired. The exhibit was placed upon shelves, the front one being two and one-half feet wide and the five narrower ones were arranged in a series of steps above and back of this. The shelves were covered with green cloth and no plates were used. Upon the wall was placed the name of the State, and under this a placard bearing the name of the society and its officers. Here also were placed the diplomas awarded to the society at the Columbian Exposition in 1893. The exhibit itself, as already stated, consisted principally of winter apples—the object in view being the exploitation of Maine's commercial orcharding rather than the display of a large number of different sorts. The most prominent varieties shown early in the season were Baldwin, Ben Davis, Northern Spy, R. I. Greening, Roxbury Russet, Bellflower, Stark, King, Blue Pearmain, and a few others. Some of the fruit came out in excellent condition; in other cases there was a loss of about 50%. This difference is due to differences in packing and in the maturity of the fruit when harvested. The following figures will give some idea as to the general condition of the fruit when taken from cold storage:

| Variety. | Date. | No. specimens removed. | Perfect specimens. | Slightly decayed. | Worthless. | Per cent perfect. | Remarks. |
|---|---|---|---|---|---|---|---|
| Exhibitor ......... | ........ | | | | | | |
| R. I. Greening .. | May 18 | 60 | 42 | 4 | 4 | .70 | A very creditable exhibit. Fruit well packed, and in good condition. Some of the Roxbury Russets slightly wilted as if immature. *Four of these badly bruised. |
| Roxbury Russet. | May 18 | 85 | 82 | 2 | 1 | .99 | |
| Blue Pearmain.. | May 18 | 65 | 62 | – | 3 | .95 | |
| Canada Red..... | May 18 | 56 | 47 | 4 | 5 | .84 | |
| Baldwin ......... | May 18 | 51 | 37 | *7 | 7 | .72 | |
| Exhibitor ......... | ......... | | | | | | |
| Baldwin .... .... | May 18 | 355 | 92 | 53 | 210 | .26 | Fruit apparently over ripe and poorly packed. |
| Exhibitor ......... | ........ | | | | | | |
| Baldwin ......... | July 11 | 285 | 250 | 29 | 6 | .88 | About 75 specimens were too small for exhibition, but all were packed carefully and in excellent condition. |
| Exhibitor ......... | ........ | | | | | | |
| Northern Spy ... | June 13 | 100 | 66 | 30 | 4 | .66 | A very fine lot; but only 15 perfect specimens remained on the table July 11. |
| Northern Spy ... | June 28 | 104 | 65 | 33 | 4 | .62 | |
| Baldwin ......... | Sept. 18 | .... | .... | .... | .... | .87 | |

In general fruit kept in cold storage is not expected to "stand up" very long after it is taken from the refrigerator, and here again there was a marked variation in the contributions of fruit as well as in the varieties sent. The most remarkable case of long keeping was that of some Canada Reds sent by Mr. B. M. Titcomb of Farmington. The specimens were placed upon the exhibition table on May 18. The last of them were removed when the exhibit was replenished on July 11. In other words, some of the specimens were in good condition for a little more than six weeks. Some Blue Pearmains shown at the same time kept nearly as long. As a rule, however, ten days to two or three weeks marked the extreme limit of time during which any variety was presentable and in many cases some specimens would decay within three or four days. The fruit placed in cold storage supplied the table until the first of September when the early fall varieties came on.

September 10, at the request of the executive committee, I went to Buffalo to attend the meeting of the American Pomological Society and to make arrangements for continuing the exhibit during the remainder of the season. At this time there were placed upon the tables two barrels of fruit from the Experiment Station at Orono and one barrel sent by Mr. Knowlton. This lot consisted of the choicest autumn varieties including Alexander, Dudley Winter, Munson Sweet, Chenango, Primate, Porter, Wealthy and many others. The expressions of surprise on the part of strangers to our State at the fact that such fruit could be grown "way down in Maine" and the words of satisfaction and commendation from those who have formerly lived in New England, were particularly pleasing.

During the time from July 10 to September 10 the exhibit was in the care of Mr. Chas. H. Ross, the superintendent of the Washington state exhibit, and he was supposed to replenish the supply of fruit as often as necessary. From the latter date to the close of the exposition other arrangements were made and the supply of fruit was regulated from this end of the line.

After October 1, Maine's choicest winter fruit was shown in all of its excellency. From Aroostook, Cumberland, Franklin and Penobscot came offers of the best that could be obtained with no expense to the society save the cost of forwarding. The result was that Maine's reputation as a great apple producing state was fully sustained as shown by the comments in the leading agricultural papers and by personal letter from Professor Van Deman, the judge of fruits.

The Rural New Yorker of October 19 says: "The exhibit of apples made at the Pan-American Exposition by the Maine Pomological Society made a very effective display. The society tried to show the commercial apples of Maine, and made no effort to collect abnormal specimens. This business-like exhibit showed all the colors and beauty of the fruit of the far West, with far superior flavor and keeping quality. We have never been able to understand why the people of Maine are so modest about showing their magnificent apples. The display at Buffalo attracted much attention but the Pomological Society ought to have had fifty times as much money as they did have for showing their fruit. As it was there was nothing finer in Horticultural Hall."

Professor Van Deman says:—"I am happy to say that your exhibit has been a creditable one, considering the opportunity which your state has had to make an exhibit here. The fruit has ranked well up in character and awards, which will soon be published, will show this to be the case. I am sure that it will result to the benefit of your State and especially to your Pomological Society which has been at the back of the entire exhibit."

## LIST OF VARIETIES SHOWN.

The following list will indicate the varieties which were given most prominence at some time during the session:—Alexander, Arctic, Baldwin, Bellflower, Ben Davis, Black Oxford, Blue Pearmain, Canada Red, Chenango, Doctor, Dudley Winter, Golden Russet, Granite Beauty, Hubbardston, Hurlburt, King Sweet, King Tompkins, Mann, Milding, Munson Sweet, Northern Spy, Pewaukee, Porter, Primate, Ramsdell Sweet, Roxbury Russet, Rhode Island Greening, Stark, Shiawassee, Tallman, Wealthy, Wine.

Other sorts were shown, but aside from a number of the more valuable Russian varieties shown by the Experiment Station at Orono, they were not provided in quantities.

Besides the apples mentioned above, several cases of choice evaporated apples from Chas. S. Pope, Manchester, were shown;

also some canned blueberries from J. & E. A. Wyman of Cherryfield, and eight varieties of pears from J. E. Bennoch, Orono.

### LIST OF CONTRIBUTORS.

The following parties contributed from one-half bushel to three barrels each:

John W. True, New Gloucester.
Chas. S. Pope, Manchester.
Chas. S. Phinney, Standish.
B. M. Titcomb, Farmington.
E. F. Purington, Farmington.
C. F. Fletcher, Augusta.
V. P. DeCoster, Buckfield.
J. W. Libby, Hartford.
S. L. Plummer, Sweeden.
G. W. Whitney, Newburg.
T. M. Merrill, Sabbathday Lake.
F. H. Morse, Waterford.
J. W. Dudley, Mapleton.
J. E. Bennoch, Orono.
Maine Agricultural Experiment Station, Orono.
F. D. Grover, Bean.
E. W. Gould, Bean.

In addition to the above, several of the exhibitors at the spring exhibition at Brooks gave the fruit which was shown there and likewise the exhibitors at the county fair at Farmington.

### THE AWARDS.

In making awards at the exposition, each exhibit was judged according to its own merits, rather than in competition with other displays. At the close of the season it was found that Maine had received two gold medals, one silver medal, twelve bronze medals and three honorable mentions as awards for the fruit shown.

### THE COST.

Early in the season it was feared that the amount of money appropriated would not maintain the exhibit until the close of the season, and after carefully considering the matter the executive committee decided to use some of the present year's funds in this direction. The wisdom of this action was abundantly shown by the magnificent display of autumn and winter fruit that came in toward the close of the exposition. By careful management, however, the cost was kept practically within the limits of the original appropriation. The following is a summary of expense incurred:

| | |
|---|---|
| Fruit purchased | $65.30 |
| Collecting and forwarding | 133.89 |
| Storage and cartage | 36.15 |
| Installation and maintenance | 267.98 |
| Total | $503.32 |

*To recapitulate:* With the exceedingly limited fund available Maine's exhibit was necessarily small. It was, however, representative and in quality it compared favorably with that from other states—in spite of the unfavorable criticism which has appeared in certain local newspapers. Any fair minded person who has given more than a passing glance at the pomological display in the Horticultural building, will concede that Maine's tables usually presented a creditable appearance and that her exhibit was not surpassed by that of any of the states which did not expend far more money and maintain constant attendance. This latter fact is, perhaps, due quite as much to the well known quality of Maine fruit as to any other condition. I may add that as a natural sequence to the display of Maine's fruit, the tide of buyers has been turned eastward during this year of short crops and Maine's farmers and orchardists are able to dispose of their crop at very satisfactory prices.

# PLEASURE AND PROFIT FROM PLANT STUDY.

By Prof. A. L. LANE, Waterville.

The profit to be derived from plant study is at once apparent from the simple fact that all our food comes from plant life. Directly or indirectly, at first hand or at second hand, all animals, and man among them, receive their entire sustenance from vegetable growth or through the mediation of plant activity. We take our daily bread at the hands of practical botanists.

It would be absolutely impossible for the seventy millions of our population to find food for themselves, still less to have surplus for exportation, but for the fact that men have made careful study of the various food plants, their propagation, cultivation, improvement, multiplication and transportation. Contrast our present abundance with the precarious existence of the Indian tribes that roamed over this country and secured scanty sustenance by hunting and fishing and to a slight extent by the cultivation of Indian corn. If he is a benefactor of the race who makes two blades of grass grow where one grew before, still more is he who introduces improved kinds of grain or better methods of cultivating and utilizing those already known. Plant study is directly contributing and absolutely necessary to this result. The practical, working knowledge of food plants, of grains and fruits, already obtained, gives us a wealth of resource lying at the foundation of national prosperity and there is still abundant room for study and improvement. It seems to be a law of nature that only the plant can feed directly upon inorganic matter, upon matter that has never been alive; and thus the higher, more intelligent life of animal and of man could not exist without the intervention of the lower and less sensitive life. Even the birds and other animals share with us in the fruits of this study and gather their food with us often from the fruits of our own labor. In the higher forms, plant and animal are separated by a wide gulf; there is great difference between a man and an elm tree, for example; but in the lower forms consisting of single cells and studied only with the compound microscope, it is harder to draw the line, and when we come to separate such a plant as a diatom from such an animal as the amoeba the task is more difficult. Here scientists make use of the principle before stated and call the one a plant and the other an animal according as it can or cannot feed upon inorganic food.

Having seen the necessity of a knowledge of plants and how to care for them even to our daily bread, let us come to the subject of pleasure from plant study. No real distinction can be made between pleasure and profit. As in the well-known defence of Bunker Hill Monument, "I would like to have the idea of good, explained and analyzed and run out to its elements" and then it would be easy to demonstrate that whatever ministers to pure and innocent pleasure is of real value. As Emerson says in his poem on one of our common flowers, the rhodora, "Beauty is its own excuse for being." Pleasure is one of the utilities of life as real as any other. Whoever would keep sane and sound and not grow morbid and misanthropic, must have varied forms of pleasure and enjoyment. The duller and more plodding the daily work the greater the necessity for change and recreation.

The largest part of our life has relation to pleasure.

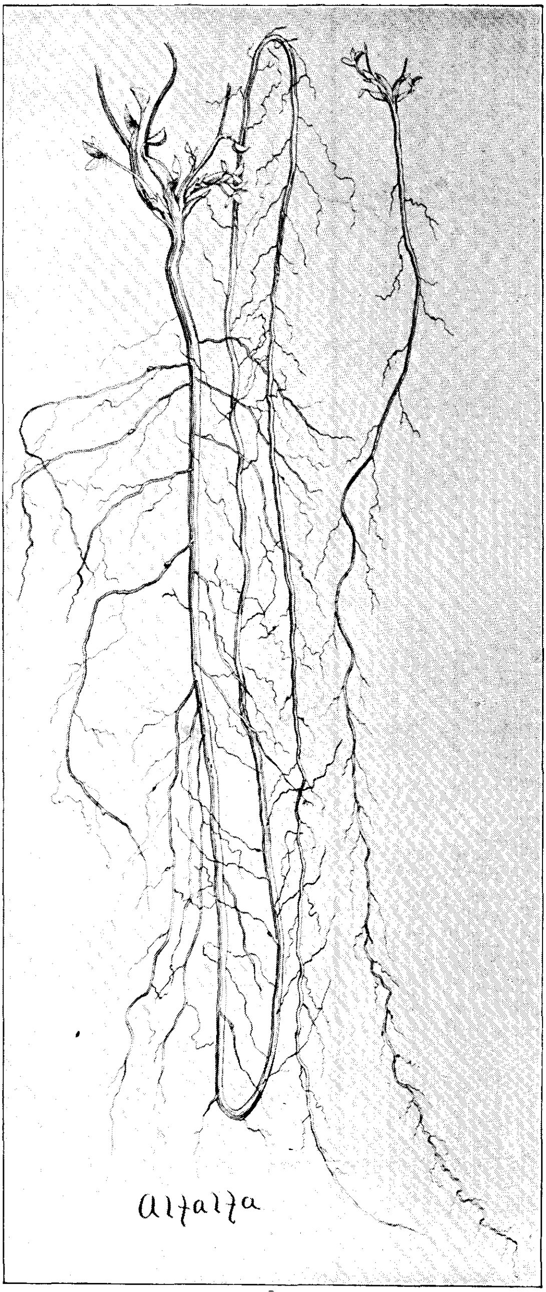
Business depends upon this element. The greater portion of the business of the world ministers to taste, to enjoyment, to the sense of beauty, to pleasure rather than to mere utility. If we are going to rule out all pleasure why not wrap ourselves in the blanket of the Indian or in the coarsest, rudest material for clothing instead of in the beautiful forms and colors with which civilized men and women adorn themselves? The world is made beautiful for our enjoyment and for our profit. We are false to our high privileges, we are going contrary to the evident purpose of creation, if we do not open our eyes to behold the beauty and our minds to understand something of the mystery with which the Creator has everywhere surrounded us. The sky over our heads is beautiful. Look upon such an evening as this and see in the western sky the new moon as a crescent holding the old moon in its arms; in the southwest see Orion, the most beautiful of our winter constellations, still shining brightly; overhead a little to the east of the zenith is the sickle of Leo with Mars the reddest of the planets still beautiful; and in the northern sky shines the Pole Star marking almost the exact north, with Cassiopeia a little removed, and the Great and Little Dippers like "the two hands of the clock in the sky" as Prof. Proctor calls them, turning constantly around the pole, but in our latitude never quite setting. Is it not worth while to be acquainted at least with the more prominent stars so that we may recognize them as old friends on their reappearance each in its season?

The very rocks are beautiful, whether as on some mountain top bold and bare, wind-swept and storm beaten, or more often gray with lichens or green with mosses or outcropping amid grasses and shrubbery. The hills and valleys are beautiful, whether the valleys are sharply cut into gorges and canyons, or by longer weathering worn down into more flowing outlines. Stand for an illustration on Mount Percival and look far out and see our fringed coasts and the many islands lifting themselves to your view and the very blue of the sea rising up to your vision until it meets the blue of the sky in the far horizon.

In the trees and smaller plants we find a beauty of endless variety and of ceaseless changes. How the trees differ in size, in form, in foliage, in coloring; how they change from season to season. Think of the giant sequoias of California 300 or even 400 feet in height, 100 feet in circuit at the foot, and in age the Methuselahs of the forest counting their years by the 6,000 or 7,000. Contrast these tallest of trees with the willows of the far north where the fully grown tree may not be more than two or three inches in height, or with the evergreen trees on Mount Washington or on our own Katahdin where the trees become mere dwarfs crouching closely to the thin soil and the rocks lest they should be torn away by the winds.

In the extensive forests of our Pine Tree State beauty and utility go hand in hand. Alas that this glory of our State should ever depart. But when we contrast the small logs which are now floated to our mills with the huge sticks of timber of which our fathers tell us, it would seem that there might be danger of regretting too late our own lack of care for our woods. Forestry and orcharding are not so far apart but that each may learn something of value from the other.

Trees have relation to each other and to smaller plants which are often very interesting and suggestive. When the farmer transplants trees into a row to serve as a protective hedge to shelter more delicate plants, he is only doing on a small scale that which nature often does on a large one. My attention has been recently called to a most striking example of this fact. When our forests of spruce are cut off, it is well known that they do not grow up at first to spruce, but that other and shorter lived trees notably birches and poplars take their place, apparently fully occupying the ground; but if one searches closely among these trees he will find here and there small spruces making their appearance, and that what is really going on is that these trees of more rapid growth and shorter-lived are furnishing protection for the slower-growing spruces, sheilding them from wind and storm until they are large enough and sufficiently compact in mosses to shift for themselves and to protect each other. Meanwhile the birches and poplars by their death and decay enrich the soil for the more vigorous growth of the coming forest of spruce. This process one may witness in different stages in different places. To witness the entire transformation he would need to live about three hundred years according to the estimate of an experienced lumberman. There are so many lines of investigation opening before the student of botany that he need never be at a loss for subjects of study. There can be no place in this State surely where the plants of one's own neighborhood would not furnish most interesting material. To set one's self the task of becoming acquainted with the plants of his own locality and doing this by personal exploration in different directions so far as he could readily extend his search, would prove to anyone at all interested in plants a most pleasant way of extending his acquaintance with them. Such tramps may well furnish a very pleasant part of the memories of one's childhood and how quickly these recollections recur at the sight or even the mention of the well-known plants. The plants will vary somewhat with the locality, but among them in most parts of Maine will be found the dandelions, buttercups, daisies, clovers, mallows or cheeses of the roadside, and the violets, anemones, jack-in-the-pulpits, trilliums, lilies, irises, dog-toothed-violets or adder's tongues, lady's-slippers and many more treasures of the more secluded hunting grounds. That fishing excursion has not been a failure of which the net proceeds consist in a bouquet of arrowheads, pond-lilies and cardinal flowers. To go specially for the flowers themselves would be even better, and less likely to end in disappointment, for in this quest, if we do not find the particular flowers we are looking for, we may find others that may please us even better. Nature is so profuse with her gifts that with rare exceptions "Everyone that seeketh findeth." The unex-




FROM DRAWING SHOWING ROOTS OF ALFALFA.

By courtesy of Prof. John Craig, Cornell University.
See article on Cover Crops for the Orchard, page 57.

pected finding of some rare plant will repay or prevent many a disapointment. It is no small joy in April after wading through snow in the woods to come out on the sunny side and to find butterflies flitting about and the ground dotted with hepaticas in full bloom, their delicate flowers in all shades from the pure white up to a most beautiful blue; or later to find by a babbling brook on a wooded hillside a level plot of rich, damp soil filled with plants of the yellow lady's slipper in full flower, so that you pick all you can well carry and yet leave many more for the next comer; or to search for years for the showy lady's-slipper and then by a passing glance find a swamp by the roadside so full of them in full blossom that you gather these largest and most beautiful of our wild orchids literally by armfuls; or in the deep seclusion of a cedar swamp where the damp moss yields like softest carpet to footfall to find by scores that rarest, daintiest orchid of them all, the beautiful calypso; or once more in the late fall, "When woods are bare and birds are flown," riding along a country road suddenly to catch a glimpse of blue by the roadside and to know that a flower long looked for in vain has been found at last, the fringed gentian of which Bryant sings so sweetly. Such experiences as these and others like them are like cold water to a thirsty soul

"The source of an exquisite pleasure,
The purest and sweetest that nature can yield."

When one becomes fairly familiar with the plants of his own locality, he may then set for himself the broader task of studying the flora of the entire State. Maine is so large a State with such varied conditions of soil and climate that it has a very rich and abundant flora and one which invites and repays enthusiastic study. The twenty-five hundred or more miles of seacoast fringed by inlets and projections and bordered by many islands, the extensive river systems, the unnumbered lakes and ponds, the bogs and marshes, the valleys, hills, mountains, the unique position, the northern oceanic current that reaches our shores, the southern slopes of many of our hills and valleys,—all these give to Maine a range of plant life wonderfully varied and interesting. To make a full study of all these plants and their localities would be a task too great for any one person, though it may be very largely accomplished by combined effort such as the Josselyn Botanical Society of Maine is endeavoring to secure. The Portland Natural History Society publishes a list of Maine plants to which additions are constantly being made. Among those specially active in this work may be mentioned Merritt L. Fernald of Harvard University and Edward B. Chamberlain of Brown University; but the name which should be mentioned with greatest honor as of one having done the largest amount of personal exploration is that of Miss Kate Furbish of Brunswick. She deserves highest credit for her work as a collector for many years and especially for bringing her trained skill as an artist to the task of reproducing in color the flowers of the State. Any one may aid in this work by exploring his own neighborhood and by putting himself into connection with other botanists in the State.

The life history of different plants is another extremely interesting line of study. To begin with the seed and to trace the growth of the plant through rootlet, first leaves, root, stem, branches, foliage, flowers, fruit, seed again, until the cycle of life is completed; to compare different plants at all these stages; to distinguish annuals, biennials, perennials in their habits of growth; to notice what office in the economy of the plant the part which we take as food or which serves as food for birds and other animals, was designed to fill; to study special contrivances as for crop-fertilization in the lady's-slipper, barberry, iris, evening primrose, sage and many other flowers; or for the scattering of seed as in the witch-hazel, pansy, burdock, bur-marigold, agrimony, dandelion, thistle, milkweed, willow, maple, poplar and so on in a list of indefinite length; all these subjects and many worthy of mention with them such as propagation of plants by runners, layers, cuttings, grafting; whole classes of plants as yet unmentioned, grasses, sedges, ferns, rushes, fungi, mosses, lichens; all these may furnish endless subjects of profitable study. A few plants must be studied to be avoided because they are poisonous. Fortunately only one plant at all common in Maine is poisonous to the touch and that is the well-known three-leaved ivy or mercury so-called. The simple knowledge that the common woodbine with leaves in five leaflets may be safely handled, and that you must keep your five fingers off of the somewhat similar plant with three leaflets, would prevent many cases of severe poisoning. There are certain common roots which are even more dangerous if eaten. When a man moves with his family upon a newly purchased farm and, as recently occurred in Winslow, within a few days loses a three-year-old son by his eating a small piece of the root of the water hemlock (cicuta maculata), ploughed up in the field near the house, it is a sad beginning of life in the new home. There are so many poisonous roots, berries and flowers that the simple rule never to eat what you are not sure is harmless should always be observed.

Another and a most interesting subject of study may be found in the various changes which take place in plant life with the succession of the seasons. It is a source of constant pleasure and of ever fresh experiences to watch the inflowing tide of plant life as it rises higher and higher from earliest spring till late summer, and then as it ebbs again until it seems to come to a dead pause in mid-winter. There is no season of the year when the botanist may not find ample material for profitable investigation. In the fall he may study the later flowers of the year, golden rods, asters, gentians, the witch hazel blossoms clinging yellow upon the stems after the leaves have fallen, many belated blossoms of earlier blooming species, and often flowers which are really early comers of the following spring, aldertags, pussy-willows, violets, strawberry blossoms and may flowers at least in bud. It is the time most forms of fruit, the fading of the leaves and other changes of the season are in their glory. It is exceedingly interesting to mark the preparations which Nature makes alike for the winter's rest and for the more vigorous life of spring.

In winter one may study the evergreen trees, the very shape of which is protective against the breaking of their branches by the snow; the general habit and branch arrangements of diciduous trees, the record of earlier growth in the scars upon their branches, and the promise of future growth in the snugly-packed buds upon their twigs; the many ways in which latent life is packed away in roots or in bulb, under ground, or in the air in buds variously covered with scales, or wool, or varnish. There is no need to mention subjects for spring and summer. They thrust themselves on the attention of every one who has eyes to see, and richly repay his observation and thought.

## PLANT GROWING FOR GARDEN AND LAWN.

By W. H. ALLEN, Augusta.

We are well aware that there are few, if any, callings, where more hours and longer days are necessary, than on the farm; yet there is need in this particular direction for a small share of our time, which would be to our advantage. A good slick looking animal will often times sell for double what an inferior looking, though far better one, will bring, but when we have the two qualities combined; the value is greatly enhanced. The eye is quick to detect the beauty of the surroundings of the most humble looking home, that has a well kept lawn and a few flowering plants to speak for the thrift of the owner. It is not necessary for us to engage the services of a landscape gardener, to carry these suggestions into effect. Let us suppose we have determined to improve the grounds surrounding our homes and we find old trees—it matters not what kind—old, simply from the lack of proper trimming and pruning; we will trim these up and shape them; if there are others that have outlived their usefulness, we will take them out; now if there is nothing to interfere, we will plow to the road and make the improvements look as if all on our own land; before grading it would be advisable to remove the top soil from and depressions, to be replaced when poorer earth has been used to bring the grade up, thus keeping the best soil on the top; we should now grade and even up the surface, get our elevations from the house to the road and make it uniform and equal. We are doing something now, which we hope to be permanent, so we use plenty of well rotted manure, made fine, and if a liberal quantity of bone meal and ashes are added; so much the better.

Lawn grass seed mixtures that can be had already for sowing, produce the best results. Not less than one quart of seed should be sowed to an area of 300 square feet, or four bushels to an acre. A perfect lawn cannot be obtained with a light seeding. After the seed is thoroughly harrowed, it should be rolled smooth and firm; this rolling is of great importance to insure a uniform catch. A lawn to continue smooth and even, should be mowed often. We now have a rich velvety lawn and we wish to further beautify it with the addition of a few plants and shrubs; this can be accomplished with a very small outlay.

We have annuals, biennials and perennials to start with; the annuals and perennials being the most popular for general use. Many of our most beautiful bedding plants can be propagated by seed, and while it is true that the hot bed or greenhouse is the most convenient for this purpose; yet it can be satisfactorily accomplished in the windows of our dwelling houses by exercising a little care, and with the use of shallow boxes two inches in depth, one-half filled with leaf mold or fine light loam, sowing the seed in rows with very light covering and pressing the seed firmly, leaving a smooth surface, a light sprinkling and partial shade from the hot rays of the sun, and being careful not to allow the young seedlings to become dry. When the first character leaves form, they are ready for transplanting into other boxes, or small flower pots; there to remain until removed to beds on the lawn. A most beautiful effect can be had through the entire season by sowing annuals in this way.

The selection of varieties depends entirely upon our own fancy, but let us picture to ourselves the effort of a border bed with either phlox Drummondii, marigold, petunias of begonia vernuon for the center row with borders of either the dwarf blue ageratum, double-flowered portulaca or Tom Thumb nasturtium, plants of dwarf habits. For circle beds, a border of verbenas with salvia (scarlet sage) next, and cannas for the center. A bed of either description is very effective. The canna may be grown from seed and will bloom the first season, if started early; the seed should be soaked twenty-four hours in water and the outer shell be nicked with a knife to insure germination. The tubers may be stored in the cellar through the winter and increased by divisions for future planting. The canna is growing in favor as a bedding plant. I might add to this list, but suffice it to say nearly all annuals are of a showy nature and add a charm to their surroundings. Coleus, achyranthes, alternanthera, centaurea and stevia verigator are for their foliage most beautiful and showy bedding plants. There is no plant yet introduced in the floral kingdom to take the place of the pelargoniums (our old favorite geraniums) and the vast improvement made in this most popular flower is really remarkable. When the hardy perennials are once established, they may be said to be there for an indefinite time.

Among the herbaceous plants of this family, may be mentioned the perennial phlox, producing immense clusters of white, pink and crimson flowers; the rudbeckia or golden glow with its numerous bright yellow blossoms, the spirea japonica, for a dwarf plant, there is nothing more graceful; hollyhocks in their various shades, and dianthus barbatus—the old garden sweet William. In hardy vines and climbers for the piazza and trellis, honeysuckle is fine, and the clematis is a great favorite, because of its large and beautiful flowers, and for climbing roses, in white, the Baltimore belle, the prairie queen in red and the modest little crimson rambler. For covering old walls there is nothing better than the ampelopsis veitchii, where it will get partial protection in winter, as it is not entirely hardy in our climate. For shrubs, hydrangea paniculata grandiflora, is so well known, it requires simply to be mentioned. A bed or single plant attracts a great deal of attention on a well-kept lawn. The deutzia and weigelia are ornamental and useful for cut flowers. Hibiscus althaea (or rose of Sharon) should be on every lawn, the diversity of color in the different sorts makes a fine display. Lonicera (or bush honeysuckle) is valued highly on account of its fragrance. Pruning of the shrubs is very important; for the flowering of each succeeding year, depends largely on the proper method pursued with the knife. Indiscriminate pruning is too often practised, because the flowering habit of the shrub either is not known, or considered. The new growth of the lilac, deutzia and others produce their bloom for the following season, and consequently only the dead wood and weaker branches should be cut back to the ground; such as the hydrangea and althaea form their flower buds on the young growth in the summer of the same year they bloom, so that a moderate amount of pruning to shape the shrub is all that is required.

There are so many varieties of plants that might be added, that I have ventured to mention but a few of our most popular kinds, but a list would not be complete without including a selection of sweet pea, if for no other purpose than to decorate the table. To insure their blossoming the seed should be sowed early in trenches, well enriched with dressing and not less than five inches in depth, only that the covering should be gradual, at first about one inch and the balance filled in as the growth advances. Yes! we should endeavor to make our homes as pleasant and attractive as our means will permit; so if we want a few specimen plants for large vases, what is more graceful than a dracaena indivisa, the araucaria (Norfolk Island pine) makes a beautiful plant either alone or in clumps, caladium esculentum is of easy culture, only requiring plenty of water, as it has leaves of immense size. For a choice selection, a bed of hardy hybrid roses might be included and for a range of color, the General Jacqueminot, a rich crimson; Baron de Bonstettin, a dark red; Margaret Dickson, white, and Magna Charter bright pink.

## FLOWERS—THEIR USE—ARRANGEMENT.

By Miss B. P. SANBORN, Ben Venue Greenhouse, Augusta.

The uses for flowers are so many and varied that it will be impossible for me to name them all, even if I could. It must be true, however, that Providence had great good in view, for we find them everywhere, on mountain tops, in valleys, in marshes and bogs, on tablelands, in our mowing fields, by the roadside in the far North where the sun shines only a few months in the year. If vegetation starts at all it is in a solid carpet of perfect tiny flowers. In our climate we have great variety, in the tropics the richest abundance, in fact, they are everywhere.

We read that in France there are acres and acres of roses grown for the sole purpose of attar of roses for the world's market. Rose leaves are preserved and used with spices for Pot-pourri jars, we have also opium from the poppy, the arnica plant grown under our feet, taraxacum from the dandelion and thousands of other things familiar to the professor of science, all made from flowers, their stems, seeds, bark or roots, besides the numerous perfumes and extracts with which the market is filled.

I found very wonderful histories of some of our familiar flowers and trees when I begun on my paper, and here is one good use to be mentioned to the young people, which is to take time to trace the origin, growth, life, character and language of these interesting plants.

I read in Henderson's "Handbook of Plants" "that the almost innumerable varieties of pansies, embracing any color from white to black, maroon, yellow, purple, blue, self-colored and those with the most delicate markings as well as the bold and showy faces of others are all hybrids between the annual species which is a weed in the English fields and gardens, and the perennial kinds from Tartary, Switzerland, and the natives of Great Britain and France and this country.

The first attention paid to the cultivation of the pansy and that which resulted in making it a florist's flower, was given by Mary Bennett, who had a small flower garden in the grounds of her father, the Earl of Zankerville at Walton-on-Thames, England. She had prepared a little bed in which were placed all the varieties of pansies which she accidentally discovered in this garden.

Aided by the industry and zeal of the gardener, several new varieties were raised from seed and transplanted to this bed. From this small beginning in the year 1810 may be traced the rage which has since prevailed in the cultivation of this popular flower. The English, French and German horticultural societies offered great inducements to the florist in the way of premiums for the finest flowers, and as the race was free to all, the interest awakened was of a most lively character, one which any gardener of importance helped to keep alive. The result has been the pansy of to-day in contrast with the little violets of our woods and fields. So much for the pansy.

I read in a "Tour Round my Garden," translated from the French, that the wood anemone is a pretty "little white flower tinged with violet." This is the original anemone which was brought into France from the East Indies more than two centuries ago by Mr. Bachellier, who grew them more than ten years before he would give a single one to anybody. A magistrate went to see him in his robes and purposely making their folds drag over the anemones in seed, contrived to carry away a few of them which adhered to his garment. The improved varieties form a beautiful rich green turf from which spring simple rose-shaped anemones, red, scarlet, purple, violet, white, or streaked with all these colors, forming a rich bed of beautiful coloring. Our gladiolus comes from South Africa, the name meaning small lily. The Tiger lily comes from Asia, the Easter lily from Bermuda, or Japan. Our white stock or gilliflowers are Italians.

Asters came from China more than a hundred years ago. The horsechestnut tree is from Constantinople; it was sent into Austria in the year 1594 and carried to Paris in 1610 by the same man who had the anemones.

Violets have been brought from almost every country even Patagonia. The market affords a perfume called violet, but it is never distilled from this flower. It never separates its odor from itself. Perfumers use the root of the Iris of Florence, which gives a slight violet odor. But the perfume of the violet you never get except from the flower itself.

There is no country without roses, from Sweden to the coasts of Africa, from Kamtschatka to Bengal, or on the mountains of Mexico; the rose flourishes in all climates and in all soils. What is the use of them? We call them luxuries, yet they are within the reach of almost every one. Even in any large cities they are brought from fields, lanes, woods, gardens and green houses. Sometimes the sidewalks are almost lined with men, women and children calling to the hurrying throng, "mayflowers, roses, violets, three cents a bunch, two for five."

Flowers are used to express love, sympathy, condolence, remembrance and farewell. We send them into hospitals, prisons, jails and dungeons. Flowering plants and vines are in most of our schoolrooms as a refining influence. Do we not always believe in the man or woman, be they ever so bad, who loves flowers? We are sure there is something in them to appeal to. "Visit a children's hospital and see how the little sufferers turn their pale faces to the flowers as the flowers turn their faces to the sun."

It was once a seven days' wonder when Trinity church in Boston furnished $500 worth of flowers for Easter Sunday, and a still greater marvel when Phillips Brooks, with his own hands, gave them every one to the mission children to be carried to their homes in the slums. Have we a sick friend? Straightway we send a bunch of flowers, and unless one has been a "shut in" and unexpectedly had a cluster of fresh, fragrant and graceful flowers brought at a time of hopeless depression and physical weakness, he can never know the sympathy and cheer which comes with them.

Think what a bunch of buttercups can be to a young person slowly dying of a hopeless disease, who knows his days are numbered, whose future is the "great beyond." The common flowers represent to him his whole past life, bringing sunshine in their color and memories of long sunny afternoons in meadows and fields, besides the feeling of being tenderly remembered in the gift. Regret and sorrow are sweetened by these pleasant memories. The giver receives the blessing of those who give the cup of cold water "In His name."

Our modern weddings are incomplete without masses of flowers for the church service; doorways, piano and mantel are daintily trimmed at the house. Roses for bride and groomsman; bouquets for bridesmaids and train-bearer. "We wreath our dead with flowers; they are the best we have to offer; 'tis the last we can do for them." "Gethsemane was a garden."

In the arrangement of flowers there are some rules to follow but usually each person has individual taste. The tendency now is for finer flowers than formerly, depending more on graceful arrangement, in contrast with the stiff bouquets and short stems of the past. Another point emphasized now is one kind of flowers in each vase or bouquet instead of a variety of flowers, also an effort is made to use the foliage belonging to the flower instead of green of another shade. Long stems and tall, slender vases with plenty of foliage are in favor with city florists. We all know it greatly depends on the flowers we have and the surroundings. This is something I am very anxious to learn about and shall be more than interested in the coming discussion.

The custom of decorating dining rooms and tables is almost universal, especially when guests are invited, and there are hundreds of tables among our working people, where you always find some dainty wild flowers in spring and summer; banks of brilliant leaves take their places later, while bright geranium blooms, which grow and bloom for anybody, anywhere, brighten the plain rooms and frugal meals during the long New England winter.

## NATURE STUDY.

By G. Harold Powell.

Now I wish to diverge somewhat from the general topics on your program and make a few remarks along another line. The progams of our horticultural meetings are usually well filled with subjects relating to the methods of fruit growing, such as tillage, spraying, varieties, marketing, and other questions closely connected with the practical side of the business, yet I sometimes feel that we are not giving enough attention to the cultivation of one of the most important products of the farm, the boys and girls who are to fill the places occupied by us in a few years. We may rejoice in the magnificent display of fruits and vegetables and the abundance of the general farm crops, but after all the most valuable crops you grow on your farms are your sons and daughters. We are taught that we must spray better, cultivate better, know more about the insect pests and fungous diseases with which we have to contend, understand more of the chemical and biological activities within the soil, and yet do we pause and enquire how are we to get all of this information? We hear much in these days of the boys and girls leaving the farm—and we are glad when one does leave it to actually better his place in life—but do we stop and ask why the boys and girls are leaving the farm? I have only a few minutes to discuss this topic and can only touch on the outside of it, but I want to say that I firmly believe that one of the first steps necessary to meet the greater demands of modern fruit growing and farming, and to attract the best boys and girls back to farm life is to foster in every possible way a close sympathy between the boys and girls and everything that lives about them. If the boys of today have an enthusiastic interest in plants, in orchards, in meadows, in soil, in animals, from their earliest childhood to manhood, the modern needs of fruit growing and farming will take care of themselves, and less will be heard of the depopulation of rural districts. The trouble today is farm life appeals to the boy mainly through his biceps, and not through his intellect and heart.

How are the boys and girls to come in closer sympathy with everything around them? Not entirely through every day experience, nor through these meetings, nor the granges, nor papers and bulletins. We believe the interest in farm life must be fostered by the public school, and that the environment of the boy and girl should form the basis of his education. We would not teach agriculture or horticulture as such in the public school, but we would bring the life of the orchard, the stock yard, the brook, the forest into the every day experience of the children, through the various studies already in the school room. We would make Nature Study the basis of a large part of the intellectual training of our young people.

The time will not allow of a discussion of the methods of teaching nature study, or of the preparation of teachers for such work. We would emphasize however the importance of this movement throughout the country on the future agricultural and horticultural industries. There have been three great educational movements for the betterment of farmers in America, first, the establishment of the Land Grant Colleges, second, the establishment of an Agricultural Experiment Station in each state as a department of the Agricultural College, and third, the nature study movement in its relation to the public schools. The last movement has not risen to the national proportions of the first two, but it is liberally supported by state aid in several instances. New York State has been the leader of the movement and thousands of dollars have been appropriated, under the direction of Cornell University to interest boys and girls in nature, and in showing teachers how nature studies can be adapted to present school methods. Other states have followed the example of New York so that now there is under way one of the most important movements looking to the betterment of farm life. I have great faith in the present public school system but I am convinced that American agriculture will be touched more closely by it, when the school is able to draw its teachings largely from its environment, when the life of the farm is part of the material on which the boys and girls build up their education. If our boys and girls catch their inspirations from the life of the meadows, the orchards, the brooks, and the forests, the manifold difficulties that now beset the fruit grower, and which will increase rather than grow smaller, will be more intelligently met by the generations that are to come, and the public school will be a more potent factor in the permanent upbuilding of rural life.

MRS. DECOSTER:

Q. I would like to ask a question of the Protessor, if he has in mind any appropriate text-book that he would advise, even before this matter is presented in a way to the public schools, that he would advise for the use of children at home. This subject has deeply interested me, and there was a move made and text-books were printed for that purpose and a partial law, I believe, requiring examination of teachers along that line, but it has become a dead letter law and the book was never generally introduced—it was called the Principles of Agriculture, written by a professor in this State—but I never knew of it being used in any of the public schools.

MR. POWELL:

No, I am unable to mention offhand any single book for teachers that covers the whole field of Nature study. There have been a large number of Nature study books written within a few years, many good, others very bad. I might mention a few books that are excellent for their purpose.

Lessons with Plants, by L. H. Bailey. McMillan & Co., New York.

First Studies in Plant Life, by G. F. Atkinson. Ginn & Co., Boston.

Insect Life, by J. H. Comstock. D. Appleton Co., New York.

The Principles of Agriculture by L. H. Bailey. McMillan Co., New York.

Nature Studies, by Mrs. Wilson. McMillian Co., New York.

The best nature study publications I have seen are the leaflets issued by Cornell University, and they are valuable because they are full of the nature study spirit and the teacher is sure to catch some of the inspiration that pervades them. These are sent at a small cost to teachers out of the state.

I would say as a general principal, and most emphatically, keep the books out of the school room. Teach from nature, not from books. The minute nature study is taught from a text-book, nature flies out of the window and the children learn by heart. The value of nature study is lost when it becomes mechanical. The spirit of out door life must be caught if nature study is to help out door life and make it more livable.

Books and leaflets should be used largely as guides by the teacher and occasionally by the pupil for supplementary reading or reference, but the book of nature is the principal text-book for the boys and girls.

Q. What I referred more to was something that would give the child a correct naming of all the parts which are necessary for the child to know. We know that many of the names of the parts, the common way we call them is not correct according to the language which great scholars use.

MR. POWELL:

Never mind the great names. The child will see the names of plants and of their parts from day to day and hear them used by the teacher and they become in time a part of the common language of the pupil. I was stuffed with big names in school and it took me a long time to get over the feeling that if I knew the name of a plant, I knew all about it.

## VARIETIES.

Inquiry was made concerning the York Imperial, and Prof. Munson replied by saying:

"It is a very good variety and one that is becoming quite prominent a little further south. The principal objection to it is that it is a little rusty and not highly colored enough for our northern markets."

Secretary Knowlton said Mr. Van Deman recently called his attention to this variety and observed that it deserved a trial in Maine. He believed it would do well there. He also called attention to some specimens of this variety he obtained from Buffalo through the kindness of Mr. Van Deman. He also referred to some Sutton Beauty, Rome Beauty and Missouri Ben Davis obtained from the same source. He also called attention to some fine specimens of Arctic sent in by Mr. O. K. Gerrish of Lakeville, Mass., and a plate of apples grown in East Dixfield. This variety, last year, sold in the Liverpool market for 27 shillings. It was sold as N. Y. Pippin, but he doubted the correctness of the name, which no one present had been able to correct.

## WHAT IS THE BEST VARIETY?

One other matter has impressed me strongly this afternoon. It is the frequency with which the question has been asked, "What is the best variety for this or that purpose?" Now the more we think of this question the more we will come to feel that after all it is largely a personal matter. Almost every man has a personal attachment for some variety, and that is the variety for him to grow, provided it has market value. The variety after all is of less importance than the man who grows it. If you are firmly convinced that Ben Davis is a high quality apple, then grow it. You will get more satisfaction out of it than in growing a spy that you grow under protest, even if you do deceive yourself. There is no such thing as a general-purpose, best apple. There are too many ideals in fruit growing today to have one sort fill every ideal. We must grasp this general principle in variety selection. The variety is largely an expression of its environment. Certain qualities that make the variety what it is are transmitted from its parents, but the quality, texture, flavor, color, time of ripening, growth of tree and other secondary characteristics are profoundly modified by the immediate surroundings of the variety. The Maine Baldwin is different from the Baldwin of New York or Delaware. It is still a Baldwin in the South but it ripens in September, rots badly, and differs in many minor essentials

The tables in this room show that you have the best possible foundation for a successful apple culture. The color of your fruit cannot be surpassed by that in any other section of the country. The clearness of the skin, the high quality of the varieties, the large size, and remarkable keeping qualities stamp the Maine grown apples as among the very best in the world. Therefore I would say to you, use your Maine apples as a basis for your future apple culture, and stop looking the country over for new kinds. Take your Baldwins, Hubbardstons, Hurlbuts, Nodheads, Kings, Ribstons, Famueses, and other equally good kinds as a basis for a more extensive Maine apple culture. Select buds only from the best individual trees of each variety for your future orchard, cultivate intensively, prune judiciously, spray constantly, pack honestly, and you can make a name in the market for Maine apples that will sell them at a good profit in competition with similar kinds from other less favorable localities. In closing my remarks on the variety question I cannot do better than emphasize strongly that the fruit growers of Maine have a distinct opportunity before them in the apple growing business, and I would encourage this society to foster that opportunity in every possible manner.—*G. Harold Powell.*

## THE FALL WEB WORM.

Mr. W. P. Atherton spoke of the prevalence of the fall web worm in the Middle States and inquired of Prof. Munson whether they were the same as ours, and how the pests could be controlled. In reply Prof. Munson said:

The web worm of the Middle States is the same as the web worm that works in Maine. There is no necessity of having the whole tree defoliated by this web worm. It is very conspicuous and by removing the branch when the web is first formed we may very readily control the pest. It is not necessary to spray. Indeed, as your informant said, it would not be desirable, it would not be practical to spray as late in the season as would be necessary to check this pest, but by simply removing the twigs when the webs first start the pest is very readily controlled.

Q. Please describe that web worm.

A. Well its is somewhat similar in appearance to the tent caterpillar in the spring, although it does not grow as large,—about an inch to an inch and a quarter in length, and it invariably forms a web over the whole twig and the web expands as the insect grows. It does not leave the tent to feed as do the tent caterpillars.

Q. If that limb is not removed, is there danger of the worms multiplying and destroying more of the orchard?

A. Certainly, and the web will continue to extend in size until the worms reach maturity.

Q. How would you dispose of the limb after it is taken off? Burn it?

A. Burn it,—yes, sir.

## THE DEXTER MEETING.

Hon. STANLEY PLUMMER, Dexter.

I was interested in what the gentleman who has just taken his seat said about nature study in the public schools, about beginning this educational system in regard to horticulture and agriculture in these great lines of business, which are so important to our State, with the children themselves, in the earliest days. I will say so far as this state is concerned that in my youth there was a text-book introduced here called Hooker's Child's Book of Nature, and it was studied in our public schools under the old system of using text-books, which we in this State are fast outgrowing; but that did a good work, suited to the time and the circumstances of the occasion. Since then in our normal schools and teachers' institutes, stress has been laid upon the teaching of nature study, and the thing begins very early in the education of the children here in the State in most of the towns, especially where normal graduates are employed and where the kindergarten system is in vogue. We in this town have two kindergartens in operation today.

I have learned a great many things here. I have attended the sessions here. I have been very deeply interested. I feel, as a citizen of Dexter, very much gratified that this meeting has been brought here. I know it will do a great deal of good, and not only to our people here but to this whole community, because it will awaken an interest in these things. I have learned that it is a good thing to cut off a bough on which caterpillars get and to burn it up, not to throw it in the road to be driven over by the passing carriage, and I have learned a great many other things of practical benefit. This matter of packages to put up fruit so that it will go on the market is an important one for us. Why, here in this vicinity we have been ransacking right and left to get barrels, old discarded flour barrels, to put up our fruit in. We have had to pay extravagant prices in order to get them. We have been unable to find any sort of package to market our fruit in, because we depended on these second-hand barrels. This is all wrong, it is a crude condition of things and it should be rectified. A fruit grower ought to be able to go somewhere and buy proper packages to put his fruit in, and I hope that will be one of the results of this agitation and of this meeting, but I must not take any more of your time.

REV. MR. GOULD:

I was brought up on a farm and spent my early days there, and I think sometimes that my interest in farming increases. I don't know but what I am a better farmer now than I was when I was living on a farm. I used to think I didn't like it very well, but when I hear such men as Mr. Hale talk about farming, Mr. Pope, and the other gentlemen who have been speaking, I think I like farming first rate.

But the word that came to me when Mr. Gilbert told me that he was going to call on me was this, the interest and value of such meetings as you have been holding here for all of our people, not simply for the people who are engaged in raising fruit but the people who are engaged in any kind of business; because in laying down the principles which must be the foundation for success in the raising of fruit, you have been calling our attention to the principles which must be the foundation for success in any kind of effort or enterprise. I don't know but Mr. Hale suggested the fact this afternoon, that a minister must work for his success along about the same lines that a man must who is growing apples. And so I felt that it was an occasion to learn, an occasion for getting inspiration and encouragement, for anybody to attend these meetings. I am very glad that the opportunity has been afforded to our community here to come in and listen to the reports and addresses and counsel and advice that you have given us at this time.

# LIVING FOR HEALTH.

By Mrs. ALONZO TOWLE, Freedom, N. H.

Phillips Brooks says: "The duty of physical health and the duty of spiritual purity are not two duties, they are two parts of one duty, which makes the most complete life that human beings can live." We start with this hypothesis, the keeping or getting of health is one part of our highest and most binding duty. To make the body a fit temple for the spirits, indwelling is a sacred obligation. For what have the leaders of men always been noted? Has it been for courage? Some ignorant and uncultured have been truly brave. Has it been for refinement? Many isolated and unknown have been most refined. Has it been for morality? Not always. One may possess all these qualities and not be at the front. With other qualifications he must have enormous nervous vitality. That which enables him to withstand long hours of close application, attention to details, and power to resist influences and temptations. We decide then that it is nervous vitality that tells. The sources of this vitality are food and air transformed by bodily functions. These functions being powerfully affected by the mental attitude of the individual, also by exercise, rest, sleep and other personal habits. That we make mistakes in our food economy is no longer a vague theme to be passed over thoughtlessly. One class eat too little, another too much. The wear and tear of an active life requires a class of food stuffs that to the brain worker would be a burden, causing dearth of thought and darkness of mind. Still the majority eat too much and too often, beside being excessive in quantity, food is often of low value or combined to be useless.

We who advocate temperance are altogether too narrow in our interpretation. It should not only mean abstinence from alcoholic beverages but abstemiousness in partaking of food. There is more sickness and untimely deaths from over-eating than from over-drinking. One physician says: "It is no exaggeration to state that fully 90% of all the population eat vastly more than they ought. The intestinal tract is overloaded causing auto-intoxication or self-drunkenness by food. The toxic matters from this mass of decaying food causes nearly all the ills to which flesh is heir, among which are insanity, meloncholia and violent paroxysms of temper in both children and adults. To those who have passed middle life, these accumulations and obstructions mean many serious diseases.

In all man's activities we find expression of thought, consciousness, and power of choice. This power makes us in a large measure arbitors over our own destinies physically and enables us to leave to posterity something better than gold, health with a knowledge of the laws governing a hygienic life. While all along the food line we fully understand that "one man's meat may be another's poison" there are a few tried and proved facts that hold good, proved even by the exceptions. Fruits are an essential in our diet, owing to their medicinal and curative qualities. Fruits, nuts, certain kinds of vegetables and cereals are best adapted to give the greatest amount of force with the least output of energy. Next in order come the pulses—peas, beans and lentils. They tell us that grapes may be given in such large quantities that the organism will absorb so much of the liquids that it reaches every part of the system restoring to a healthy state of functional activity. There is no fruit of the earth which enters so largely into the appetizing plans of the household and public as the apple. To those of sedentary habits it is a daily need. One of our senators is said to be a marvel in the amount of work he performs in the Senate though over sixty-five years old. He says it is owing to his daily lunch of apples which he has taken exclusively for years. Beside apples and grapes are the delicious pears, luscious peaches and all the small fruits. Fruits are not only wholesome but delicate and nice, easy to serve and always relishable. It would be far better to let them take the place of our desert of rich pastry.

There was, at one time, a wide-spread report that German soldiers were to be supplied with sugar as a part of their daily rations. It caused quite a number of a certain class to partake of extra quantities, saying "it must be that lots of sugar is good for us." Different conditions call for different treatment. Soldiers upon a march in cold weather in a severe climate require heat-producing food. Sugar produces heat and energy beside is easily transported. An extra supply for us is but adding fuel to a fire already well supplied if our diet is what is best for us. The digestive organs will elaborate sugar from nearly all fruits, cereals and vegetables, we have no need of a large extra allowance. Bread, the staff of life, the mainstay of humanity from earliest date, is so important an article of diet to all, that the systematic extraction of the brain-sustaining phosphates, leaving it little better than starch, calls for an entire change. While our population may increase at the rate of 100%, brain and nerve troubles are increasing at the rate of 600%. The immediate cause is a lack of brain nutrition. Primarily the lack is in the bread we eat. The most valuable part of the grain lying in the outer covering. A brain cannot act with vigor unless fed. Brain starvation is the one cause of the craving for stimulants that one class have to meet. "Tell me what you eat and drink and I will tell you what you are" is not a very old or far-fetched adage. Edison says, "He who eats rice only, thinks rice only." Working people have by hard experience, learned certain dietetic usages. Bread and milk, pork and beans, meat and potatoes, chicken with rice or dumplings, eggs on toast, oatmeal with cream, for thin workers have the best results and they have something like the right combination. While faulty, viewed from a scientific standpoint, they are preferable to those dishes concocted to tempt the appetite because they taste so nicely. While advising the cutting down of our meat-eating some will object, bringing the old Hebrews as an example of a sturdy, healthy race of flesh-eating people. At first thought, it seems that is true. Quite the reverse is the fact. Their diet, like that of all Orientals, was simple, light and mainly of vegetable origin, the staple being bread, made from the whole grain or from rye with the flour of millet, beans or lentils added, making a perfect food.

Fruit was abundant, also vegetables, with honey and oil. They were pretty good hygienists from necessity. We have here as article No. 1 under Living for Health, to eat less food, of better combination, masticate thoroughly, drinking only pure water.

New England people can well follow the last prescription. From every hillside bubbles and sparkles pure, sweet water. Here and there may be found mineral waters of great value. The time was not so long since the people were drinking spirituous liquors as an every-day beverage. We have had to take our temperance reform by installments. At first it provided for breweries for those who were reforming, next in order was a cutting off of all beer and cider-making, but prescribed strong coffee in its place. One noted temperance worker it is said, would get away with twenty cups of strong tea in as many minutes. Now hygienists say tea and coffee should take their proper places with all other stimulants and nervines.

The second source of vitality is the air. The importance of proper breathing has been recognized in all ages. In many religious systems the breathing has occupied first place as a means of training in self-control. The breath means life. Without food we may live forty, fifty or sixty days. Without liquids for several. Of all the essentials to life the oxygen of the air is most important. The more we breathe the more oxygen. The more oxygen the more life. Throughout the animal kingdom from the mouse that breathes 150 times in a minute to the elephant that breathes six times, the same rule holds good. The stronger the animal, the deeper and slower it breathes. Our great men of all times and countries, our Napoleons, Martin Luthers, Cromwells, Websters, Gladstones and Bismarcks have all been deep chested, full breathing men with well-developed, active lungs, the consequence being vitality and the force that comes from vitality. In an examination of over a thousand men and women, less than one per cent. made proper use of their lungs. Of all the vital activities the breathing is most under the control of the will. When chests are sunken and lung capacity small, a few months patient, persistent work under proper direction will, in most cases, show improvement in both form and vitality. Shoulders are appendages of the chest. Rounded or stooping, they can never be made to take their normal place until the chest is expanded and uplifted by active lungs. One hindrance the business women of today will be obliged to meet is the condition of business places. Many reek with foul air, bad ventilation and unsanitary surroundings. The mass of women do not hold their health as dear as they ought. Even the housekeeper clings too much to her own fireside, especially in cold weather. The woman of vigorous constitution may be able to pull through, but most need a daily constitutional to feed brain and nerve with pure oxygen. Some say they are too tired when the time presents itself, that they cannot do this, too tired to walk and breathe vigorously enough to expand the lungs. Breathing does not tire, but strengthens heart and lungs, purifies the blood, and stimulates the entire system. Oxygen is a far better tonic and health-preserver for women than any drugs or stimulants. Breathing affects nutrition in several ways. It hastens the peristaltic movements of the stomach and intestines, it oxydises the blood, then removes from the body through the lungs certain poisonous waste matters, the retention of which weakens the organism. Sleep has an important part in increasing vitality. Better sleep is needed in some cases, more in others, more and better in still others. If we reform our diet, sleep in well-ventilated bed-chambers, breathe well, and practice muscular relaxation, that is, let go of ourselves and allow the bed to hold us, instead of trying to hold ourselves, with a fairly good conscience, we shall sleep the sleep of childhood.

Article third is as important as the other two. It is: To labor every day with the muscles, with the mind and with the moral powers. To labor more is not a general need with agricultural people. To labor less and recreate more would be far better for hard workers. Farmers' families have physical exercise enough for growth and strength. Those of other vocations have had to invent something in exercise equivalent to work. He who does out of door work is sure to breathe more nearly correct than any other. If he is not always judicious in food selection and combination, he will take better care of it than any other class and is less likely to suffer from it. Sometimes we workers wonder if our burden of work is not heavier than others' burdens. We frequently feel that our cares are more numerous and annoying than those of the other half of the world. Do not allow such ideas to find resting place in your minds for an hour, it is not the truth. It has been my privilege to know both sides of the question. Providence has used some of us better than we should have used ourselves if we had control of circumstances. There are many people of wealth who would give a part of their gold and all of their dull days, miserable feelings and idle hours for the ability to do physical work, digest their food, sleep well, following it by still more work. There is as much comfort and satisfaction coming to men and women as they look upon their goodly herds and crops, gather around them their broods of birds and watch the peculiar workings of their families of bees as comes to any people living. The breadth of living that comes to one who appreciates the country for all there is in it, has not its equal in any city or town. At one and the same time we are getting good health and giving to the world a valuable product. As we have progressed the old sentiment, that to do manual labor is degrading, has died out.

It has always been an insult to genius, talent and industry, the powers that rule the world. Progress that assumed the well-being of the human race, to be their end of education was embodied in the thought of extending man's empire over matter. To make men perfect physically or otherwise we never can. To make them more comfortable is the end of all right effort. For sixty generations those old ancient philosophers worked upon the body and mind. What did they accomplish for our practical help? Since Queen Elizabeth, more has been done than in all the years from Plato and Socrates down the line. Gladstone says, "From 1800 to 1850 there was as much permanent wealth produced as during the 1800 preceding years." One hundred years ago there was no science worth the name. Since then men have been studying and investigating with the object of doing something. It has already lengthened life, wiped out many diseases, made life healthier and therefore happier. They called it a curse that "in the sweat of his brow man must eat his bread." That is the only way he can healthfully and happily eat it, then it is his—he has a right so to do. We are learning that crime is a disease or the result of disease. Crime is the costliest product of our civilization and is increasing in this country to a greater relative degree than in any others except Spain and Italy. New York spends six millions of dollars for police and prisons while only a little over half that amount is used for educational purposes. If "an idle man's brain is satan's workshop" then the first act for us is to furnish work to those who will work, making the idle, indolent and unbalanced do something if under surveillance. We should be in earnest, for these crimes called disease, or this disease called crime, there must be found a remedy or the whole country will be made to suffer again and again. Our America, our United States is a magnificent gift, one of inheritance. If we still sustain our former characteristics and keep progressing we shall see to it that the deep-breathing of our patriotism throws out all poisonous and noxious elements, that the good red blood of our forefathers makes us strong and staunch for a liberty not to be confounded with license and for safety, unguarded which should be the pride of every republic.

Teaching always that work makes mind and character. Not overwork, but employment that is worthy. Teach that whatever dignifies life and makes that labor sweet, whatever awakens in us an enthusiasm for heroic and just acts is a part of the grand whole. The power to dare and bear for what is right, to stand firmly, then go, these qualities are a large part of our recommendation to the world and out of all struggles we may come with more enduring fiber. We have heard it said so often that "brain power rules the world," that we sometimes forget the action and reaction between brain and muscle and the close relationship between mind and body? We scarcely have it in mind that muscle fiber is doing its part in digestion and respiration and sending the life-giving current to every organ, tissue and cell. That it is important in controlling all mental processes that result in intellectual effort, some learn alas, too late.

Emerson says: "See only that thou work and thou canst not escape the reward. Whether thy work be coarse or fine, planting corn or writing epics, so only it be honest work done to thine own approbation it shall earn a reward to the senses as well as the thought." Ruskin says: "So with our youths. We once taught them to make Latin verses and called them educated, now we teach them to leap, to run and hit a ball with a bat and call them educated. Can they plow? Can they sow? Can they plant at the right time or build with a steady hand? Is it their effort to be chaste, knightly, faithful, lovely in word and deed? Indeed it is with some, nay with many and they are the strength of the English nation." May we, Americans, have not less, but more of that real culture which is omnipotent over human destiny. So that when the centuries have rolled away, our civilization passed out giving place to another or others, we may be seen clearly in the looking backward and felt for our strength, health and symmetry, chosen and immortal for practical helps through all after changing years. Yes, changing, continually changing.

God only is unchangeable, the same yesterday, today and forevermore. Go back to the morning of history and guided by modern thought let the mind retire into those ages long past and you have not found the birthplace of the Eternal Father. Then as now, His mercy, His justice, His love and especially His physical laws were the same without shadow of turning.

## JOHN W. TRUE.

Some years ago a man of New Gloucester birth said to the writer, that "to be well born was more than half a man's success." So have I often thought of this other New Gloucester man of whom it is a pleasure to write at this time. Being born in New Gloucester was a fortunate beginning, for I know of no rural Maine home more pleasantly located than his. His parents were both of strong character and sterling integrity. Such was the inheritance of John W. True.

He was born in New Gloucester, August 4, 1848, where he spent his boyhood days. He was educated in the common school and two years at a private school in his own town. At the age of nineteen he went to Boston, where he was employed in the express and grocery business for seven years. On the death of his father in 1874, he returned home where he has lived ever since.

Mr. True married Carrie Murdock of Springfield, Mass., in 1873. They have four children, two of whom are graduates of Bates College.

He is a successful farmer. When he began farming for himself, the farm carried ten head of cattle and one horse. Year by year he has improved the farm to such an extent that he now has thirty-five head of cattle and three horses to do the work and a small flock of sheep. The old orchard has been added to until he has one of the best cultivated orchards in the State. Many of the trees are too young to be large producers, though he has had good crops for several years, and I know of no orchard in Maine more promising than this, in the development of which he and his family have taken so much pleasure and satisfaction. Nor is this all, for in recent years he has had an ideal farmer's fruit garden stocked with all the fruits needed by the family with a surplus for his neighbors.

He has been exact in his farming operations, and they have been conducted in a business-like manner. There are few farmers who can tell from what particular line of work they have made money; but Mr. True has carefully systematized his farming so that he knows not only what pays but how much this or that crop has cost and how much he received for it. Farming would become more profitable if more of this work was done.

He has been a man among men, and his neighbors and townsmen have delighted to honor him with official responsibilities. For nineteen years he was a member of the board of selectmen, sixteen of which he served as chairman. Several times he was elected chairman without a dissenting vote. New Gloucester is known to be one of the best governed towns in this State, and it is certainly a high tribute to hold the highest office so many years. The town has long been out of debt, has long had the best of schools, the best of highways, a good town house, fine public library built and maintained by town, and all the other good things that have contributed so largely to make New Gloucester one of the most popular farming towns in Maine. For two years he was town clerk, and the past three years he has been town treasurer. He is a justice of the peace, and is now a deputy sheriff of Cumberland county.

Mr. True has long been identified with the agricultural interests of the town, county and State. For several years he was trustee of the Cumberland County Agricultural Society and a member of the Board of Agriculture. He was elected a member of the executive committee of the Pomological Society in 1888, and was elected year after year until he was chosen president of the society in 1895 where he served four years, when he was again elected a member of the executive committee. At our last meeting he declined re-election. Mr. True's associates in this society have always had the fullest confidence in his judgment, and all the duties assigned him have been well performed. His influence in building up the society has been far reaching. When he became an officer of the society, there was a debt hanging over the treasury and a deficiency in the permanent fund. So well managed has the society been during these years he has the satisfaction of retiring from office with the society's debts all paid and a balance in the treasury, the deficiency in the permanent fund made up and the fund safely invested. Less than a hundred life members were enrolled when he became a member of the society; now there are 141. In his official relation to the society he has always advocated the best interests of the organization, and in all his words of counsel he has advocated improved methods and progressive work. He was most convincing in his words to fruit growers for what he told them grew out of his own experience among his trees and plants.

D. H. K.

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The abbrevation "Sta." signifies the Experiment Station Report, and the abbreviation "Pom." the Pomological Report.