Public Documents of Maine:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

Public Officers and Institutions

FOR THE YEAR

1897.

VOLUME I.

AUGUSTA
KENNEBEC JOURNAL PRINT
1897

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*Not published.

RIVER AT POLAND SPRINGS.

AGRICULTURE OF MAINE

THIRTY-NINTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

BOARD OF AGRICULTURE,

FOR THE YEAR

1896.

PRINTED BY ORDER OF THE LEGISLATURE.

AUGUSTA
KENNEBEC JOURNAL PRINT
1897

STATE OF MAINE.

To the Honorable, the Governor and Council of Maine:

In compliance with the laws of the State, I have the honor to present the report of the doings of the Maine Board of Agriculture for the year 1896.

B. WALKER McKEEN, Secretary.

AUGUSTA, May 1, 1897.

MAINE BOARD OF AGRICULTURE—1896.

OFFICERS.

W. H. VINTON, PRESIDENT.
J. W. DUDLEY, VICE PRESIDENT.
B. WALKER McKEEN, SECRETARY.

MEMBERS CHOSEN BY COUNTY AGRICULTURAL SOCIETIES.

				Term expires 3rd Wed. in January.
Cumberland	County,	W. H. Vinton,	Gray,	1897
Oxford	"	S. F. Stetson,	East Sumner,	1897
York	"	L. O. Straw,	Newfield,	1897
Somerset	"	George Flint,	North Anson,	1897
Sagadahoc	"	T. E. Skolfield,	Brunswick,	1897
Aroostook	"	J. W. Dudley,	Castle Hill,	1898
Franklin	"	C. E. Wheeler,	Chesterville,	1898
Knox	"	E. E. Light,	Union,	1898
Penobscot	"	George N. Holland,	Hampden,	1898
Piscataquis	"	W. H. Snow,	Milo,	1898
Hancock	"	Vacancy.		
Androscoggin	"	B. F. Briggs,	Auburn,	1899
Kennebec	"	W. G. Hunton,	Readfield,	1899
Waldo	"	W. H. Moody,	Liberty,	1899
Washington	"	A. R. Lincoln,	Dennysville,	1899
Lincoln	"	John M. Winslow,	Nobleboro,	1899

MEMBERS FROM THE STATE COLLEGE.

President A. W. Harris, Orono.
Prof. Chas. D. Woods, Orono.

ELECTED BY THE BOARD.

B. Walker McKeen, Secretary.

MAINE BOARD OF AGRICULTURE—1897.

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J. W. DUDLEY, PRESIDENT.
W. H. MOODY, VICE PRESIDENT.
B. WALKER McKEEN, SECRETARY.

MEMBERS CHOSEN BY COUNTY AGRICULTURAL SOCIETIES.

				Term expires 3rd Wed. in January.
Aroostook	County,	J. W. Dudley,	Castle Hill,	1898
Franklin	"	C. E. Wheeler,	Chesterville,	1898
Knox	"	E. E. Light,	Union,	1898
Penobscot	"	George N. Holland,	Hampden,	1898
Piscataquis	"	W. H. Snow,	Milo,	1898
Androscoggin	"	B. F. Briggs,	Auburn,	1899
Kennebec	"	W. G. Hunton,	Readfield,	1899
Waldo	"	W. H. Moody,	Liberty,	1899
Washington	"	A. R. Lincoln,	Dennysville,	1899
Lincoln	"	John M. Winslow,	Nobleboro,	1899
Cumberland	"	John J. Frye,	Portland,	1900
Oxford	"	John F. Talbot,	Andover,	1900
York	"	L. O. Straw,	Newfield,	1900
Somerset	"	S. H. Goodwin,	St. Albans,	1900
Sagadahoc	"	T. E. Skolfield,	Brunswick,	1900
Hancock	"	Nahum Hinckley,	Bluehill,	1900

MEMBERS FROM THE STATE COLLEGE.

President A. W. Harris, Orono.
Prof. Chas. D. Woods, Orono.

ELECTED BY THE BOARD.

B. Walker McKeen, Secretary.

MAINE BOARD OF AGRICULTURE.

ANNUAL MEETING, 1897.

The annual meeting of the Maine Board of Agriculture was held at rooms of the Board, State House, Augusta, January 20th and 21st, 1897.

WEDNESDAY, A. M.

Meeting called to order at 11 o'clock by J. W. Dudley, Vice President.

Committee on Credentials, appointed by the Chair, W. H. Snow, Geo. N. Holland, J. M. Winslow.

Committee on Pay Roll, appointed in the same manner, W. G. Hunton, C. E. Wheeler, T. E. Skolfield.

On motion of B. F. Briggs, voted that O. O. Stetson act as messenger for the Board during this session.

Records of the last annual meeting read and approved.

The Committee on Credentials reported the following named gentlemen duly elected members of the Board: T. E. Skolfield of Sagadahoc county, S. H. Goodwin of Somerset county, L. O. Straw of York county, Nahum Hinckley of Hancock county, John F. Talbot of Oxford county, John J. Frye of Cumberland county, each for a term of three years; and Prof. Chas. D. Woods, member from the State College ex-officio.

This report was accepted.

Committee to receive, sort and count votes, appointed by the Chair, S. H. Goodwin and L. O. Straw.

Officers were elected as follows: President, J. W. Dudley; Vice President, W. H. Moody; Executive Committee, J. W. Dudley, W. H. Moody, W. G. Hunton; Member of Advisory Council of the Experiment Station, B. W. McKeen.

The Committee on the Old Orchard Field Day was called upon to report.

T. E. SKOLFIELD. I supposed that Mr. Vinton, the chairman of this committee, would make some report. I will simply say that we met and carried out the program. The Board of Agriculture day was very satisfactory, but I think the Grange day was not quite so satisfactory.

L. O. STRAW. Mr. President: I felt in the beginning that this was a union meeting, and paid as much attention to one day as the other. We all know that in a meeting where it is known that there are to be two days, the first day usually has the laboring oar; people are gathering on that day. I saw no particular difference in the two days, except that there seemed to be a larger attendance on the second day than on the first. The interest was the same, and I think our speakers were on a level. We had some very interesting speakers the first day, and those who attended had a most excellent day. The first day was very rainy, which was against us. The second day was a very fair day, the speakers were equally good, and there were more people present. I could see no particular difference in the feeling of the people on those two days. I think it was a very profitable session, and that our people, especially, were well paid for their time and attention. I think it would be well to try it again, rather than to give it up at the first trial. One thing is very sure,—that we excelled New Hampshire. It was admitted generally that our meeting was better attended, and fully as profitable a meeting as those that have been held in New Hampshire. I think our New Hampshire friends were very much pleased with the meeting.

I have nothing in particular to say, for the Board or for the Grange, in relation to that meeting. It was a joint meeting, and I think all moved harmoniously, except for one or two things. On the first day Prof. Robertson gave his lecture in the evening, by request, in part, and it was generally understood that he was to continue this lecture the next day. The next day's program seemed complete, and it was made up of that class of speakers who could not be rejected or omitted in any way, and I think that was the principal reason why we rather shut out Professor Robertson. I think he thought nothing of it, and had no hard feelings.

W. G. HUNTON. I think there is one thing that has been overlooked in this report, that the members of the Board outside of the Committee ought to understand about, and that is this:—As I understood it myself, and from discussion with other members, the meeting of the Board on that occasion was in one sense a meeting for instruction. My idea was that at that meeting we should have speakers who would give us ideas that might benefit us in our institute work. I think on that line the meeting was instructive and accomplished a great deal of good. I think the ideas which we got from Dr. Harris and from Prof. Robertson of Canada did a great deal of good throughout the State as they were promulgated by the members who heard them. The only thing that I have to regret is that the Board, as a Board, did not attend. There was a misunderstanding in regard to the meeting, I think, to this extent;—some of the members of the Board thought that it was a Board meeting and that they were entitled to pay for necessary expenses, and others did not. I believe if the Board could have a meeting with the idea in view that we have some such speakers as we had at that time, and gather such new ideas as they would give us, that it would be a very good thing. I think we should have it earlier in the year, before the majority of our institute work is in progress.

T. E. Skolfield. The fairs at that time hurt the meeting, and I think it would be well to hold it earlier if it should be held again. I should want to know something about what the expense would be before I recommended another meeting. Can the Secretary give us any idea of the expense of that meeting as compared with the institutes?

Secretary McKeen. The expenses of that meeting were $139.50. I could give you some idea of the average expense of getting the Board together, from the expense of the Field Day at Orono, which was $102.04. I should estimate that the expense of another Field Meeting, with the expenses of the members paid, would be about $300.00.

The report of this committee was accepted.

REPORT OF THE EXECUTIVE COMMITTEE.

A meeting of the Executive Committee was held at the Bangor House, Bangor, Tuesday evening, June 2nd, all the members being present. Several matters were considered, and advice and suggestions received.

In accordance with the vote of the Board at the last annual meeting, the committee proceeded to vote upon the location of the next dairy meeting. The vote was that it be held at Skowhegan, in connection with Skowhegan Grange. This was the only vote that was taken at the session.

A meeting of the Executive Committee was held in connection with the full Board at Hotel Coburn, Skowhegan, on the evening of December 1st. Considered the matter of the inspection of feeds and seeds and appointed a committee consisting of Prof. Chas. D. Woods, Prof. G. M. Gowell, and Secretary McKeen, with instruction to report at the annual meeting.

Respectfully submitted,

W. H. VINTON,
J. W. DUDLEY,
GEORGE FLINT,
Executive Committee.

This report accepted.

Prof. CHARLES D. WOODS. Mr. President: At a meeting of the Advisory Council of the Experiment Station I called attention to a matter in regard to the fertilizer law, which I wish to present to you. On page 145 of our report, section 4, you will find a cause which reads as follows:—"Ten dollars for the phosphoric acid and five dollars each for the nitrogen and potash, contained or said to be contained in the fertilizer, this fee to be assessed on any brand of which thirty tons or more are sold in the State." As I understand the history of this fertilizer movement in this State, the design was that we should reduce, as far as possible, the number of brands which were sold in the State, so as to make as little confusion as possible to the average farmer when he comes to purchase. Instead of a reduction in the number of brands there has been a great increase, not only in Maine, but everywhere else. There was an increase of nearly 50 per cent in the number of brands last year, and the indications are that there will be a considerable increase this year. While I would not want to bring any accusation against any firm, it is certain that some of our large firms sell a great many brands in the State, of which they say they are not going to sell more than thirty tons. They introduce a new brand which differs only very slightly from one which they have been selling. I think the tendency of this is to confuse the farmer, and it also adds to the burden of the Experiment Station in its work in enforcing this law, because the law compels us to examine the fertilizer just as truly if a man sells one ton as if he sold three thousand tons. The work we have to do is just the same. It happens that there are fifteen, twenty-five or perhaps thirty brands which will be sold this year, so far as I know, inside of that thirty ton limit. The dealers will be exempted from paying the fine, and that is a hardship in two ways. One is, that a large amount of work devolves on the Experiment Station, which it has to do out of the money which it receives from these fees; the other, that it is a great disadvantages to the purchaser, as he is misled and bewildered by the increased number of brands. It seems to me that it would be possible for us to reduce the number of brands if we should either strike out these words entirely—"Of which thirty tons or more"—or substitute a much smaller number. I know of only one manufacturer of fertilizers in the State that asks for exemption under that limit. They are mostly outside of the State. The council suggested that we introduce a bill at this session of the legislature, amending that section of the law so that it shall read, "Ten dollars for the phosphoric acid and five dollars each for the nitrogen and potash, contained or said to be contained in the fertilizer, this fee to be assessed on any brand sold in the State." In this way anyone that introduced a fertilizer would have to pay a license fee, the object being that we should reduce the number of brands. I would like to have the advice of this Board in regard to introducing such an act. As I understand it, this same amendment was made last year, and by a clerical error, when the bill actually passed the House, this clause was left in. I may be mistaken as to that, however.

Mr. Moody—I think it would be well to draft a bill and subject it to the Board.

J. M. Winslow. I wish to speak a few moments in regard to the State stipend. If there should be a committee chosen to present matters to the legislature, I believe there is a matter in the division of the State stipend which rightfully should be attended to. I have not come here to beg for myself or anybody else; my idea is the rightful distribution of the money raised to go to the several agricultural societies of the State to promote and encourage agriculture. In Lincoln county we haven't had any State stipend for two years, and the year before we received only 50 per cent., as we paid only 50 per cent. of the premiums awarded. This year we held a fair,—I think you might call it holding a fair, as we had the exhibit, and had everything ready—and the first afternoon took some money at the gate, about $28.00. That was all the money that we got. We had been to the expense of getting ready for the fair, and had the exhibit all there except the cattle, and kept running until Saturday, and it rained as hard as it could pour all the week. Consequently we were left with a debt, and awarded no premiums, and as the stipend is paid according to premiums and gratuities awarded we were shut out from that. It comes very forcibly to my mind that the stipend should come in right at the time when we need it. We had made the effort, and were not to blame that it did not succeed. The year before we held no fair for the very reason that we had had several rainy seasons and had failed to meet our bills, and had a debt of between eight and nine hundred dollars. We had a meeting, at which Secretary McKeen and Professor Gowell were present and encouraged us, and we sent a man out to collect the money, and paid the debt right out of our pockets, giving from five to one hundred dollars each. This year we had this rainy season, and so all the way along we do not get a dollar. The same thing has occurred in many other counties, and it looks to me as though a division of that money might be made so that societies like that, unless they were at fault themselves, or were debarred by gambling, might have the benefit of it. The people are taxed, and the money is raised, to encourage agriculture. Some counties which have good weather and a successful fair get the money, while the counties that fail on account of poor weather, something for which they are not at all to blame, do not get a dollar to encourage them, just at the time when they need encouragement. My society has not asked me to say anything about this matter, nor anybody in my county. I simply speak of this as a member of the Board. I have nothing to put forward, but I have thought that the law might be changed so that 50 per cent. of the State stipend should be divided among the societies that have a right to receive it, pro rata. I leave it for you to think of, and at the proper time you can put it in the hands of your committee if you wish to do so.

Adjourned until 2 o'clock, P. M.

WEDNESDAY, P. M.

Report of the Committee on Feed Inspection, by Prof. Chas. D. Woods, Chairman.

MR. PRESIDENT, MEMBERS OF THE BOARD: The committee reports favorably upon an action for a feed law, and we have drafted, based upon the present fertilizer law, a law for the control of feeds. I have several copies which I will distribute. Those of you who are familiar with the fertilizer law will find that, with the exception of one or two points, to which I shall briefly refer, it conforms to our present fertilizer law, the chief difference being in regard to the way in which we propose to raise the revenue necessary to put such a law into effect. In the case of the fertilizer law this is by a license fee, but in this case we propose to make it a tonnage tax instead of a license fee, so that the cost of the feed inspection shall fall not equally upon all manufacturers, but shall fall upon them in accordance with the amount of business which they do. This license fee, in my opinion, is the great objection to the fertilizer law to-day.

I wish to say just a word in regard to the history of this movement. An attempt to have a feed inspection was made in Massachusetts, and a bill was introduced at their last session of legislature; but the bill, as they had it then, did not meet with the approval of the Chamber of Commerce, and the result was that it was defeated. They have now drafted a bill upon the same general line, which has met with the approval of that body, and is quite likely to become a law.

The necessity for a feed law depends upon two facts. One is that even to-day our concentrated feed stuffs, such as linseed meal, cotton seed meal, etc., differ very greatly in composition, and a man is not sure of what he is buying, any more than he was sure of what he was buying in fertilizers a few years ago, and that condition will grow worse instead of better. The other fact is that if the Massachusetts legislature passes the bill which is before them, which it is quite likely to do, our State would then become a dumping ground for the feeds which would be shut out from consumption in Massachusetts. The Massachusetts bill differs from our proposed bill in that it carries an appropriation. There seemed to be two very valid objections in the minds of your committee, to framing the bill so that it would require a definite appropriation by the legislature. One was that in the present condition of the finances of our State it might be difficult to get a law passed, no matter how good it was, if it carried an appropriation. And the second objection, which had even more weight, was that if the sale of feeding stuffs increased in the future as it has in the past, the appropriation which we would make this year would be inadequate at the next session, and so on. A tonnage tax would, of course, not meet with those objections.

Now a few words in explanation of this bill. In regard to the feeds included,—of course hays and straws would not be included anyway, and we thought it would not be wise to include the whole seeds of grains, because they differ comparatively little in their chemical composition, and there is little chance for fraud. The same thing is true of the unmixed meals; the differences are not great enough so that it would be worth while for us to take those into account. This is also true of brans and middlings when they are unadulterated, so that pure bran and pure middlings would be exempted; but the moment there is enough of oat hulls so that they are conspicuous, it becomes a mixed feed, and would not be exempt, in accordance with this law. The brans and the middlings, while they differ somewhat in composition, do not differ greatly enough so that it would be worth while for us to take them into account. They are not taken into account in the Massachusetts bill.

The request as regards samples, in section 4, differs from the fertilizer law in that the sample is only required when the director requests it, in this case, while in the fertilizer law the sample is required unless the director excuses the party. In the majority of instances the manufacturer's sample is of practically no value.

Section 5 is in substance the same as the fertilizer law, except that in the fertilizer law there is a license which falls upon a man whether he sells little or much,—that is, above the thirty ton limit. This law has the advantage that the revenue will increase as the sales of goods increase, and consequently the inspection fee will be always adequate. A question might arise here as to what the revenue will be in excess of what is needed for the inspection. I do not know that any man can reasonably answer that question. It is difficult to tell what the revenue will be, and it is difficult to forecast what the cost of the inspection will be. The inspection demands chemical analysis, but the expense will be only about half as much as in the case of fertilizer analysis. But with our fertilizers, we can draw the samples all in the month of May, and only have to look out for the inspection for a limited time. This feed inspection would cover twelve months of the year, and it is very difficult to say what the cost would be. It may be that 25 cents a ton will give a larger revenue than is necessary, but if that is found to be the case it is very easy for us to ask to have that tax reduced. If we should place it at a lower figure and found that it would not meet the expense, we would have to fight the battle all over again. So it seemed to your committee wiser to place it at 25 cents per ton. I will say that this is the law in several of our Southern and Western states in regard to fertilizers; it is not a new idea.

I was talking with Senator Roberts and Master Wiggin in regard to the reports to be published from time to time, as provided in section 7, and they suggested that we put into the requirements of the publication that it shall include a statement of expenditures, and that the director shall from time to time make a report of the amount of this revenue and the expenses of the inspection, so that the financial status could be known.

I will say in regard to this law, that it is perfectly simple and easy. There is no more difficulty in carrying it into execution than with our present fertilizer law.

This report was accepted and laid on the table until Thursday morning.

REPORT OF THE SECRETARY.

Mr. President, and Members of the Board of Agriculture: In making another report to you, as the secretary of this Board, I am pleased to note that the agricultural progress of the State has kept pace well with that of former years; so much so that there appears to be a feeling of encouragement along all lines of work.

The necessity for advanced methods, never so apparent as now, is fully appreciated by the large majority of our farmers, and the demands for better work along all lines of instruction are rapidly on the increase.

With the single exception of hay, the crops have been abundant, and, as a rule, have been raised at a less cost than in former years. The prices, notably of our apples and potatoes, have been very low, so much so that in some sections the large bulk of these crops remains unsold.

The increased use of farm machinery, and the better scientific knowledge that everywhere abounds, appear to have served to increase the amount of the products without correspondingly increasing the demand. We look, of course, for a reduction in prices as the cost of production lessens, but not to the extent of practically driving the goods from the market. It would therefore seem that we ought to bend our efforts towards a careful study of what may perhaps be termed

FARM ECONOMICS.

Our Experiment Station and our Agricultural College are teaching the science of agriculture; they are constantly bringing to light new truths and new methods, all of which have a marked effect on the ability of the individual to effect production, but which seldom tend toward opening up new avenues of trade. It appears to me, from observation as well as from reports and other means for obtaining facts relative to the matter, that while science is constantly showing how to increase the income of the farm in the products of the soil and the herd, the main question which now confronts the farmers of Maine is how to produce and market their crops so as to secure a satisfactory income from their farms. I therefore conclude that it is legitimate work for this Board to try to place before our farmers such facts as may enable them to lessen the cost of production, and at the same time render their products of such a nature as shall enable them to be sold at fair prices in the best markets.

The aggregate amount of the agricultural productions of Maine is very large, but still we are large purchasers of the products of the soil from sources outside the State. It would appear to indicate something wrong, that with one county alone of sufficient magnitude and with sufficient agricultural resources to be able to supply New England with bread, and with so many sections of the State highly developed agriculturally, we are still such large purchasers of food products. Our farmers must be taught the wisdom of producing all the stock fodder in its various forms, and all the food for family consumption that their circumstances will warrant. This work may be supplemented by placing before them as many facts relating to the markets as it is possible to obtain. New avenues of trade may in this way be opened, and new demands created for our products.

THE CONDITION OF MAINE FARMERS.

During the past year I have made a somewhat careful study into the condition of our farmers, as compared with years past, and I am pleased to say that as I look at the matter in all its bearings I am forced to the conclusion that their avenues for supplying themselves with the necessaries and luxuries of life are in most sections continually broadening, and, as a rule, their indebtedness is not increasing. We see our schools and higher institutions of learning receiving larger patronage than ever before, we see that the young men and women who enter them are, as a rule, better fitted than formerly, and we know that a large proportion of them come from the farm homes of the State. We see these homes better equipped than ever before for the production of just such attributes in our young people as shall make them better men and women, better citizens. It is generally known that the government instituted, a few years ago, an investigation into the amount of farm mortgages, and the per cent of interest which was being paid on farm indebtedness, and I quote from the report of the Secretary of Agriculture, a few of the conclusions which he draws.

"The farmers of the United States hold 72 out of each 100 farms occupied by their owners, absolutely free from mortgages, or other incumbrances. The debts secured by liens upon lands used for tillage and the production of crops, aggregate, after throwing out the mortgage indebtedness of railroads and other corporations, less than one-sixth of the total indebtedness of the citizens of the United States secured upon real estate. Out of each 1,000 farms in the United States only 282 are mortgaged, and three-fourths of the money represented by the mortgages upon the 282 farms was for the purchase of those farms or for money borrowed to improve those farms."

We also find from this report that the proportion of farm mortgages in the North Atlantic states paying five per cent. or under is 30.60 per cent., while the proportion paying not more than six per cent. is 98.16 per cent. These figures tend to show a small proportion of the farms mortgaged, and that this class of securities, in the North Atlantic states, at least, is not discriminated against by those who have money to loan. While we have no statistics as to the indebtedness of the farms of Maine, by itself alone, we are safe in assuming that it is not more than the average for the states just quoted, and probably it is less than this average.

REDUCTION OF VALUES.

For quite a period of years the farmers of Maine have had to face quite a serious reduction in farm values, that is, the value of the plant as well as the articles placed upon the market, and this fact has led to some dissatisfaction and discouragement on the part of those engaged in the business. Many have set themselves to work to ascertain the causes for this reduction, and various reasons have been assigned for it. I am of the opinion that by far the most potent cause is the general downward tendency of prices and the somewhat unprecedented industrial conditions by which we find ourselves surrounded. Still, there are some things to which I may, perhaps, call your attention, which may show some light upon the condition from a purely agricultural standpoint. In the first place, we find that under the Homestead law the Government has, during the last thirty years, given away nearly 2,000,000 of farms of 80 acres each. These farms of course contain many millions of acres of arable land, and increase the amount of the agricultural productions of the country quite largely. Railroads have either preceded the settlers into these districts or have rapidly followed them. This has brought the freight on the products grown on these distant farms, which cost their owners practically nothing, down to but a trifle more than that upon products grown in the Eastern and Middle states which go to the same markets, either domestic or foreign. The period following closely on the close of the civil war, in which productions of all kinds were unduly stimulated, also led to a further settlement of lands in this portion of our country. These lands are possessed of their virgin fertility and of course grow crops very abundantly, but they must for quite a long time be such crops as require but little skill for their production, and with which the farmer in older sections of the country and nearer our larger Eastern cities should not attempt to compete. This condition drives him into the production of the finished product, forces him to intensify his work and sell skill as well as labor, which exists alone in the raw product. When we fully grasp the situation, and by carefully husbanding our resources and avoiding the unnecessary purchase of the products of these Western farms, and by putting skill into our work raise ourselves above their competition in a measure, we shall find, I firmly believe, our condition improved, and our farms, even with their somewhat reduced value, of more real worth to us than under former conditions of high prices and crude work.

OUR LIVE STOCK.—NUMBER AND VALUE.

The following tables are taken from the State Assessors' Report for 1896.

NUMBERS OF LIVE STOCK BY COUNTIES FOR 1896.

Counties.	Horses.	Three-year-old Colts.	Two-year-old Colts.	One-year-old Colts.	Cows.	Oxen.	Three-year-olds.	Two-year-olds.	Yearlings.	Sheep.	Swine.
Androscoggin	7,074	286	220	182	9,541	419	1,297	1,779	2,304	3,965	2,517
Aroostook	15,263	1,335	1,289	889	12,763	748	2,139	3,926	5,963	32,138	7,168
Cumberland	12,374	328	280	141	13,665	823	957	1,613	2,252	4,683	3,488
Franklin	5,396	383	332	213	5,781	1,509	1,479	1,851	2,566	30,877	2,090
Hancock	5,736	222	182	82	6,232	533	422	886	1,403	11,241	1,420
Kennebec	12,021	678	492	267	13,054	1,329	1,977	2,804	3,679	20,702	4,764
Knox	4,649	191	125	84	4,944	450	526	729	1,022	6,795	1,352
Lincoln	3,938	233	153	92	4,797	1,369	572	978	1,378	7,413	1,391
Oxford	9,519½	603	373	235	12,604	2,161	2,639	3,195	4,641	17,490	3,960
Penobscot	15,823	952	921	429	16,957	608	2,289	3,494	4,656	39,394	9,760
Piscataquis	4,541	290	219	162	4,514	279	764	1,131	1,393	15,509	1,977
Sagadahoc	2,762	71	78	43	3,048	408	334	527	661	2,924	479
Somerset	9,639	717	530	390	10,502	1,689	1,940	2,600	3,962	46,765	4,137
Waldo	7,380	434	319	209	7,724	1,001	1,334	1,737	2,595	22,108	3,368
Washington	5,834	313	258	167	7,226	159	348	1,297	1,980	9,828	1,532
York	10,385	257	214	72	12,692	1,988	1,017	1,700	1,969	4,554	2,428
	132,334½	7,293	5,985	3,657	146,044	15,473	20,034	30,247	42,424	276,386	48,831

Total number of cattle, 254,222.

VALUES OF LIVE STOCK BY COUNTIES FOR 1896.

Counties.	Horses.	Three-year-old Colts.	Two-year-old Colts.	One-year-old Colts.	Cows.	Oxen.	Three-year-olds.	Two-year-olds.	Yearlings.	Sheep.	Swine.	Total values.
Androscoggin	$393,387	$13,466	$ 7,758	$ 5,174	$222,032	$19,199	$24,803	$23,824	$16,287	$ 8,989	$14,253	$ 749,172
Aroostook	656,666	45,535	30,748	15,031	191,092	15,284	26,598	34,716	25,833	71,695	30,732	1,143,930
Cumberland	757,198	16,558	10,275	4,011	299,665	38,715	17,978	22,925	19,187	11,309	23,856	1,221,677
Franklin	265,935	14,919	9,230	4,179	132,804	62,487	30,110	25,477	18,230	55,027	12,126	630,524
Hancock	316,928	12,883	8,328	2,846	138,314	20,906	8,148	12,194	11,966	22,083	8,965	563,561
Kennebec	684,160	29,447	16,482	6,847	294,767	55,725	39,477	39,803	28,611	43,193	29,297	1,267,809
Knox	260,918	9,221	4,420	2,056	115,899	20,305	10,778	10,522	8,895	15,154	8,080	466,248
Lincoln	206,270	12,120	5,449	2,553	101,358	58,670	11,615	13,904	11,891	15,342	8,387	447,559
Oxford	436,978	23,063	10,735	4,629	270,094	91,939	50,562	41,920	33,772	38,081	22,171	1,023,944
Penobscot	752,183	33,010	23,268	7,595	338,500	21,349	36,583	39,153	28,018	85,590	38,014	1,403,263
Piscataquis	203,842	10,036	5,949	2,970	85 254	9,421	11,961	13,687	8,711	31,906	11,605	395,342
Sagadahoc	144,515	3,095	2,590	1,090	66,313	15,417	6,116	7,103	5,437	6,376	3,445	261,497
Somerset	474,823	27,472	16,487	8,713	227,999	69,153	38,107	36,819	30,913	87,458	24,669	1,042,613
Waldo	351,782	15,762	9,013	4,272	157,341	37,280	23,163	21,712	17,447	44,189	18,861	700,772
Washington	316,527	15,001	9,303	3,977	132,923	5,158	4,694	13,343	11,488	18,429	9,493	540,336
York	606,278	11,490	6,352	1,536	250,698	80,746	19,283	21,537	14,735	10,181	15,022	1,037,858
	$6,828,340	$293,078	$176,387	$77,479	$3,025,053	$621,754	$359,976	$378,639	$291,421	$365,002	$278,976	$12,896,105

As we compare these numbers of our farm animals with those for 1895 we find an increase of 4,183 in number of horses, a decrease of 1,367 in number of three-year-old colts, a decrease of 2,348 in number of two-year-old colts, and a decrease of 1,091 in number of one-year-old colts. The increase in number of horses the past year has, therefore, been caused by importation.

Our cows have increased in number since 1895, 3,077, or 2 per cent. The increase in the number of oxen is 672, or 4.5 per cent. The decrease in the number of three-year-olds is 4,070, or 20 per cent. The increase in number of two-year-olds is 1,499, or 5 per cent. The increase in the number of one-year-olds is 8,046, or 23 per cent.

Sheep have decreased 38,046, or 12 per cent. Swine have increased 4,314, or 9 per cent.

It will be noted that there is a rapidly increasing proportion of young stock, there being a rapid gain during each year, so that there are more one-year-olds than two-year-olds, and more two-year-olds than three-year-olds. If the same proportion as to sexes holds in the young animals as between oxen and cows, we now have in round numbers 223,478 cows, and heifers above one year of age.

HEALTHFULNESS.

I believe that just at this time, as we are beginning to make a reputation for ourselves as a dairy State, and when there is a large and growing demand for these products of our farms, we should give our live stock interests careful attention. We cannot fail to appreciate the necessity for maintaining our herds in health and thereby keeping up the reputation of our products in the general markets, as well as enabling us to produce more and at a greater profit. I believe that the attention of this Board should be devoted quite largely to work that will help the farmers of the State into a better appreciation of the necessity for cleanliness among their herds, for perfect sanitary conditions to be maintained in and about their barns, and for a general oversight of the health of all their animals. I believe that the suppression of disease, even, depends more largely upon proper sanitary conditions than upon the killing of animals, and am of the opinion that there should be a rigid inspection of barns and stables by some competent authority. It would seem that a part of the money appropriated by the State for extirpating contagious diseases could better be used for this purpose than in paying for animals after they have fallen a prey to disease. Maine is to be congratulated upon the general healthfulness of her farm animals, and if we may rely upon such comparisons as we may make by noting the extremely small proportion of animals rejected from among those sold for export, we may conclude that the percentage of diseased animals is very small indeed.

I believe that our work in this direction should be along educational lines, and that we may profit from the example and experience of other states, and avoid extreme measures and large expenditures of money. It is particularly desirable that our various agricultural organizations and institutions should work together in perfect harmony to encourage the live stock interests of the State, and for the purpose of investigating and controlling disease. It is necessary that there be a full and free understanding among all who have these interests in charge, and that each and every branch engaged in the work should have the full confidence of the stock owners of the State.

OXEN AND STEERS.

I note an increasing interest in oxen, both for farm work and for the market, and ascertain that they are selling at prices somewhat advanced from those of previous years. I believe it may be well to encourage the growing of steers, particularly in sections remote from dairy centers and where there is no apparent prospect for opportunities along dairy lines. As prices rule now our farmers can obtain as much, and in some cases more, for steers of from two to three years of age as they can for heifers of the same age and quality. The growing of those steers will open up a new revenue upon many farms, and help to induce the growing of more of the crops for which Maine is peculiarly adapted. This does not call for any radical change in breeds or treatment, as in many sections we have for a foundation stock just the right kind of animals for this work. I believe also that upon general principles the agriculture of our State will be made much more profitable by this movement, as I have noted with some degree of anxiety the large amount of money which leaves the State annually for the purchase of horses grown upon the cheap land of the West; these horses being, as a rule, not a class the increase of which will tend to improve the stock we now have. Far too many of these horses go upon farms on which there has been no adequate provision made for raising something which may be exchanged at a profit for money with which to purchase them, and on which there appears to be a lack of effort and skill necessary to bring them nearly up to their capacity for production. In such cases the purchase money comes directly out of what should have been net profit. I shall be glad when our farmers turn their attention more to the growing of their own farm teams.

LIVE STOCK IN AROOSTOOK COUNTY.

I think some special effort should be made to induce the farmers of Aroostook county to place more live stock upon their farms, as the agricultural future of that region depends largely upon a rapid increase in the number and value of the farm animals. Efforts are now in progress toward securing a market for the varied products of the county, hoping thereby to encourage the production of live stock. This is one of the finest sections for dairying, sheep thrive wonderfully here, and in no section of the country with which I am acquainted is there such a promising outlook for farmers to engage in the growing of young stock, for which, if first class, there is always a ready sale.

EXECUTIVE COMMITTEE.

The Executive Committee have held but two meetings during the year, but have been consulted freely by letter and by personal interviews, and have rendered valuable assistance in the work.

SEED AND FEED INSPECTIONS.

The importance of obtaining pure seeds, both in grain and grass seeds, cannot be overestimated, and the matter of seed inspection has been prominently before the public during the last year. While I believe that much of the trouble comes from careless work by the farmers themselves and from neglected roadways and hedges, I hope the Board will feel to take some definite action upon the matter, and put it in a tangible form, so as to place it before the legislature for its consideration. I also wish to again call your attention to the importance of the inspection of many of our commercial feeding stuffs, particularly such as are by-products from the manufacturing of some other article. Prof. Woods, of the committee to which this matter was referred, has prepared a draft of a bill, which he will present for your consideration at such time as you may direct.

CROP BULLETINS.

The publication of these bulletins has been continued through the season, with an increasing demand for them. The list is constantly increasing, largely by personal requests from farmers, who ask that their names may be placed thereon. The circulation is now about 6,000.

Thanks are due to the members, and our correspondents generally, for the painstaking replies and valuable remarks with which they have favored us. I believe it will be for the best interests of the work to increase the scope of these bulletins as largely as possible, as through them we are able to reach a large number of persons whom we otherwise could not, and thus carry a farmers' institute into the homes of a large number each month. I am hoping the amendment of the postal bill, which will allow them to pass through the mails as second-class matter, may pass the present session of Congress, as if it does it will enable these and similar publications of other Boards to obtain a far more important place in our work than they could otherwise.

UNITED STATES BULLETINS.

No branch of the Department at Washington is productive of more good, or the means of disseminating more valuable information than the Farmer's Bulletins, so called. They treat all important subjects connected with farm work, and should be studied very freely by all. A postal to the Director of Experiment Stations, or to your member in Congress, Washington, D. C., will bring them to all. I wish their value might be impressed upon our farmers generally.

OUR DAIRY AND CREAMERY INTERESTS.

The dairy interests of Maine are in a prosperous condition. Prices for dairy goods have ruled higher the past year than for nearly any commodity sold from our farms, and the output has been somewhat increased. Several new creameries have been started into successful operation, during the past year, and one factory for condensing milk. This factory is taking quite large quantities of milk from farmers in its locality at prices which appear to be fairly satisfactory. The condensed milk factory at Newport is using an increased quantity of milk, amounting to 2,000 gallons per day, for which it is now paying 12c. per gallon, making a monthly payment amounting to $6,240.00, and there are more large herds of cows among its patrons than in any other section of the State. Notwithstanding the somewhat large increase in the amount of the output of our creameries and dairies, the sale of sweet cream to go outside of the State has so withdrawn the bulk of the butter from our markets that some creameries have purchased it from Boston and the West, and, putting their stamp upon it, sold it to their regular customers. Until we can supply the trade of our own cities with butter and at the same time keep our cream trade abroad, it appears there should still be room for an increase of the business.

We believe that, as a rule, confidence prevails between our creameries and their patrons, and as the Babcock method of testing cream is better understood it gives better satisfaction. There may, however, be some modification in methods necessary in order to further perfect its work, considerations of which will, without doubt, come up during this meeting. After using the test myself considerably for several years, and seeing its use in various creameries and on some farms, I am firmly convinced that there is no more danger to the creamery patron from dishonesty in its handling than there is in the handling of the scales and the yardstick in ordinary commercial work. Neither is it difficult for the operator to ascertain whether or not he is doing good work. It requires training and skill, of course, to so perform the work that the results may be correct, but the merest novice can ascertain at a glance whether or not the separation of the fat is complete.

The law requiring all the glassware to be tested and all the users of the test to be certified by the superintendent of our Dairy School has, I believe, been cheerfully complied with by our creamery managers; and while but very few of the flasks or pipettes have proved to be incorrect, the mistakes which would have been made by the use of these, and the increased confidence which is felt by the average creamery patron, proves the wisdom of the law.

It will be remembered that I called the attention of the Board in my last report to the damage to our cream trade, which might possibly come from the use of preservatives by designing men. Investigations were afterwards made by Professor Jordan which brought out the knowledge that as far as could be learned none of our creameries are using any substance as a preservative, but that they are depending upon the process of sterilization and rapid cooling, to increase the keeping qualities of the cream. So far as I know, the enviable reputation of Maine cream in the markets of our cities has been fully maintained, and the sale, although at a somewhat lower price, has been fully up to the amount of former years.

THE PRESS.

The Department is under increasing obligations to the press of the State for extended notices of our meetings and for general co-operation in our work. Copies of the Maine Farmer, Turf, Farm and Home, Bangor Commercial, Lewiston Journal, Country Gentleman, Hoard's Dairyman, New England Farmer, New England Homestead, and Mirror and Farmer, come regularly to the office and are placed on file for binding.

CATALOGUE OF THE REPORTS.

Upon looking over our reports somewhat carefully we considered that their value to the Department and the farmers of the State would be materially increased by the addition of a card subject catalogue. Mrs. L. D. Carver, who has had much experience in this work in the State library and the Lithgow library in this city, was engaged to make this catalogue, and spent two months of continuous labor in the work. We now have it arranged, with appropriate alphabetical guides, and by its use anyone is able to readily find any one of the five thousand subjects which have been treated since the reports were first issued. This same system is now being extended to the various Experiment Station Bulletins received, and will, I believe, form a valuable addition to them.

Our mailing list is now being revised, and as the work is continued we shall place it upon cards, alphabetically arranged; in this way it can be kept in perfect order at all times, as additions of names are made by simply inserting a card in its proper place.

INSTITUTES.

I wish to again acknowledge the very efficient work which the members of the Board have done in connection with our institute work. There has been a constant improvement in methods of advertising, and the result shows in the increased interest and attendance. In many of the institutes there has been much enthusiasm manifested, which has helped the interest and effectiveness of the work materially.

A two-days' meeting was held in Union, Knox county, in which the subject of dairying was the principal topic, and the results would appear to indicate that similar meetings might be held to advantage in various sections of the State. There is a growing demand for speakers who are trained in the work, and who have practical experience along the lines they are attempting to teach. There appears to be no reason why a person should have less practical knowledge of a subject to be a successful teacher than he should to be a successful worker, in fact it would seem the reverse should be the rule.

Nearly every request for these meetings which comes to the office is accompanied with the desire that some speaker who can treat some subject from a scientific standpoint be taken along. Thus we find that all are beginning to more fully appreciate the value of such knowledge to supplement the personal experiences of practice.

We continue the permanent record of these meetings, and their cost. The time reported covers the Board year, from the third Wednesday in January, 1896, to the third Wednesday in January, 1897. Institutes have been held as follows:

North Berwick, Saco, Cornish, Rumford, Bethel, Bryant's Pond, Otisfield Gore, Yarmouth, Union, Topsham, East Poland, Turner Centre, Brewer, Damariscotta, North Jay, North Fayette, Oakland, South China, Bolster's Mills, Manchester, Milo, Perry, Dennysville, Epping, Hancock, North Bluehill, Bucksport, Lee, Old Orchard, Evening Meeting at State Fair, Lewiston, Orchard Field Meeting at Chesterville, East Livermore, Hermon, Bradford, Washburn, New Sweden, Limestone, Sprague's Mills, Sherman, Cary, Lincolnville Centre, Searsmont, Liberty, Centre Montville, Bristol Mills, North Warren, Palmyra, Appleton, South Warren, Monson, East Dover, and State Dairy Meeting at Skowhegan. The total number of these meetings is 52; total cost, \$2,131.79, average cost, \$41; total attendance, 13,350, average attendance, 257, an increase of 122, or 90 per cent from that of 1895.

As it is impossible to leave the office for institute work during the session of the legislature, it was thought to be proper to hold several institutes during the latter part of December, which otherwise would not have been held until the beginning of the present year. There is due on these and balance on Dairy Meeting, about \$300, which will be paid from the appropriation for 1897.

OTHER MEETINGS.

In addition to these institutes and the State meetings, the Board attended the Annual June Field Day at Orono, at a cost of \$102.04 and have paid for incidental expenses as follows:

	\$102.04
Lewiston Journal, advertising, etc.	23.00
A. M. Spear, counsel	50.00

Geo. H. Hamlin, paper for report................	20.00
J. M. Bartlett, chemist...........................	6.00
Wm. R. Sessions, copies to complete set of Mass. Report..	6.00
Mrs. L. D. Carver, cataloguing..................	160.00
E. H. Jenkins, photographs......................	5.00
H. E. Stillman, butterine work..................	35.85
D. P. Knowlton, framing pictures...............	8.75
Bills for institutes held between Jan. 1 and 16, 1896.	456.50
Cost of institutes..............................	2,131.79
	$3,004.93

January 31. I attended meeting of Somerset Dairy Association in Grange Hall, Starks, speaking on the advisability of building more creameries in that locality.

February 12. Attended dairy meeting of Kennebec Pomona at Cushnoc Grange Hall, Vassalboro, speaking on "Dairy Work in the Farm Home."

February 15. Attended evening meeting of farmers in hall of Frederick Robie Grange, Otisfield Gore, speaking on "Some Essentials for Success in Dairying."

April 25. Attended creamery meeting at Milo. Spoke on "The Advantages of the Creamery System." Interesting meeting, good attendance.

May 1. Attended meeting of the Buxton & Hollis Agricultural Society at Bar Mills. Spoke on "Some Farm Questions." Pres. Vinton was also present.

June 2. Attended meeting of the Experiment Station Council at Orono. All the members of the council were present, and the work of the station in the different departments for the past year was outlined by the professors in charge of each department. As the new director wished to have an opportunity to learn some of the local matters in connection with the work, no suggestions for future work were made, but it was understood that there should be another meeting of the council early in the fall.

July 25. Visited Old Orchard with the meeting committee for the purpose of making preliminary arrangements for the holding of the joint meeting on August 27 and 28.

July 28. Visited the farm of Mr. Stephen Miller of Sidney, to make investigations regarding an insect which was said to be injuring the potato crop. This insect proved to be the Cucumber Flea Beetle.

July 29. Visited the orchard of Mr. W. P. Atherton of Hallowell, for the purpose of observing the effect of spraying and of pasturing with sheep.

August 17 to 21. Attended the New England Fair at Rigby, having charge of the speaking on "Good Roads." Two lectures were delivered, one by Prof. C. F. Allen of Massachusetts, and one by Mr. E. C. Jordan of Portland. Assisted in testing the milk for the Sweepstakes Dairy Premiums.

August 24 to 26. Attended the Eastern Maine Fair at Bangor, occupying the rooms provided for the Board by the society, and taking charge of the testing of the milk for the Sweepstakes Dairy Premiums.

August 31 to September 4. Attended the Maine State Fair at Lewiston, taking charge of the testing of the milk in the Sweepstakes Dairy Test; occupying the cottage provided for the Board by the society.

September 18. Attended the York County Fair at Saco.

September 25. Attended the South Kennebec Fair at Windsor.

October 1. Attended the West Oxford Fair at Fryeburg.

October 7 and 8. Attended Bristol Town Fair at Bristol, taking charge of the milk testing.

October 16. Attended public meeting of Cascade Grange at Oakland, speaking on "General Farm Work."

October 17. Attended the Sagadahoc Fair at Topsham, taking charge of the milk testing.

October 22. Visited World's Food Fair, Boston. The exhibits of food consisted mostly of manufactured products, and while they were of quite a general nature I was still considerably disappointed in the general arrangements and the methods of handling the exhibits.

November 20. Attended meeting of the Experiment Station Council at Orono, at which all of the members were present. Matters of considerable importance were discussed at the meeting and action taken upon them.

November 24. Attended a meeting of the farmers in Grange Hall at Lamoine, and spoke on the subject of dairying.

December 11. Attended a meeting of farmers in Agricultural Hall, North Ellsworth, and spoke on the subject of "Milk and Cream Testing."

It may not be out of place to say that besides attending these fairs and meetings, I have attended, personally, all of the institutes but two.

CORRESPONDENCE.

The correspondence of the office is constantly increasing. Many people write for information upon various matters connected with their work, and I intend to answer every such letter, no matter how trivial it may seem, as the subject probably is of vital importance to the party writing. A complete copy of all letters written since May 1st has been kept, and we find that they amount to 1,250 or 150 a month. This, of course, is exclusive of all the correspondence connected with the work of the bulletins, which calls for the stamping, directing, and filling of nearly 7,000 envelopes each month.

ENTOMOLOGIST AND BOTANIST.

There are coming to this office freqently from farmers, specimens of insects, weeds and grasses for determination, which are sent to the entomologist and botanist of the Experiment Station, and he has rendered valuable service in this work. It would appear that it might be well for the Board to have an officer of this kind, and I call the matter to your attention, thinking perhaps you will desire to take some action at this meeting.

BOOKS ON AGRICULTURE FOR THE STATE LIBRARY.

Books are constantly being purchased for the State Library, and the various interests of the State are invited to make known their choice of books on subjects which relate to their particular lines. The librarian informs me that he shall be very glad to have this Board indicate to him its choice of books treating on various agricultural topics which you would like to have placed in the library, that he may have it as a guide in his purchases during the coming year. I recommend that a committee be formed for this purpose at this time. I wish to call your attention to the laws relating to State aid to free public libraries, a copy of which is placed on the table.

COUNTRY ROADS.

It will be remembered that I called the attention of the Board to this matter at our last session. Since that time interest in the movement for good roads has constantly increased, and I believe the subject will command the careful attention of this legislature.

Farmers are fully as much interested in this work as any other class of people, as all their products must be drawn over the public highway, before reaching the railroad. Any improvement which lessens the strength required for drawing a given amount, any labor which removes obstructions and improves the general appearance of our country highways, adds to the value of our farms and practically brings them nearer the business centers of their respective localities.

I have thought it best to give this subject some prominence in this meeting, and feel that the Board should do something to aid in the movement.

AGRICULTURAL SOCIETIES.

I visited quite a number of the fairs held by the different agricultural societies the past season, and have been much pleased with the general condition of thrift which I find. The prevalence of rain during the season for holding the fairs interfered materially with the attendance in many sections, and thereby reduced the receipts somewhat, but as a rule they have been fairly successful financially, and the amount of exhibits has been large, and their quality of a high order.

I find that, generally, the fair officials desire to see the laws of the State fully enforced, and have been much pleased with their evident desire to co-operate with us in every way possible for that purpose. One society, by the character of its advertisements in the newspapers, and its premium list, indicated its plan to run regardless of all State laws in relation to gambling, and a visit to its fair grounds during the fair convinced me that it was being run in full accordance with that plan. It was therefore omitted from the list of societies entitled to a stipend from the State.

I am of the opinion that whenever any agricultural society incorporated by this State, openly advertises to run its fair in defiance to any State law regulating such societies, there should be some provision made whereby its charter may be revoked.

Complaints were made to this office that another society had openly allowed gambling on its grounds, but after investigating the matter as fully as possible, and receiving quite a number of letters from various parties who were present during the fair, I concluded that the evidence was insufficient to warrant withholding the stipend. I still believe that it is well for the Board to have a closer supervision over this matter, and again recommend that it be taken into consideration.

I append a summary of the business of the societies, as returned to this office.

Number of horses and colts exhibited	1,796
Number of neat cattle exhibited	6,972
Number of sheep exhibited	1,618
Number of swine exhibited	730
Number of poultry (coops) exhibited	1,125

ANALYSIS OF AWARDS.

Total amount of premiums and gratuities paid	$17,675 93
Amount of trotting purses	23,237 56
Amount of entry fee for trotting purses	9,786 66
Actual cost of trotting purses	13,450 90
Per cent of premiums and gratuities to total awards,	43 00
Per cent of entry fees	42 00
Per cent of stipend	37 40
Per cent of decrease in awards	12 00
Number of societies receiving stipend	41
Decrease from 1895	11

BETTER PROTECTION FOR WOOL GROWERS.

It is generally understood that there is a very large amount of shoddy used in the manufacture of so called woolen goods, a fact which tends very much to lower the price of wool in our markets and lessen the income of our sheep raisers. I am informed that in many instances there is but a very small amount of wool used in much of the cloth which is supposed to be all wool. This is in the nature of an adulteration, and an imposition upon the purchaser, as well as upon the producer. One county in the State, in which the people are particularly interested in sheep raising, has taken concerted action to endeavor to bring this matter to the attention of our legislators, thinking that perhaps some law may be passed that will remedy the evil, wholly or in part. I believe the exigencies of the case demand prompt action, and think all the states in sections where sheep raising can be made more profitable should unite in the passage of some uniform laws on the subject.

Respectfully submitted,

B. WALKER McKEEN, Secretary.

This report was accepted, and a committee to take the same under consideration was appointed by the Chair, as follows: C. E. Wheeler, John J. Frye, L. O. Straw.

INFLUENCE OF WIDTH OF TIRE ON DRAFT OF WAGONS.

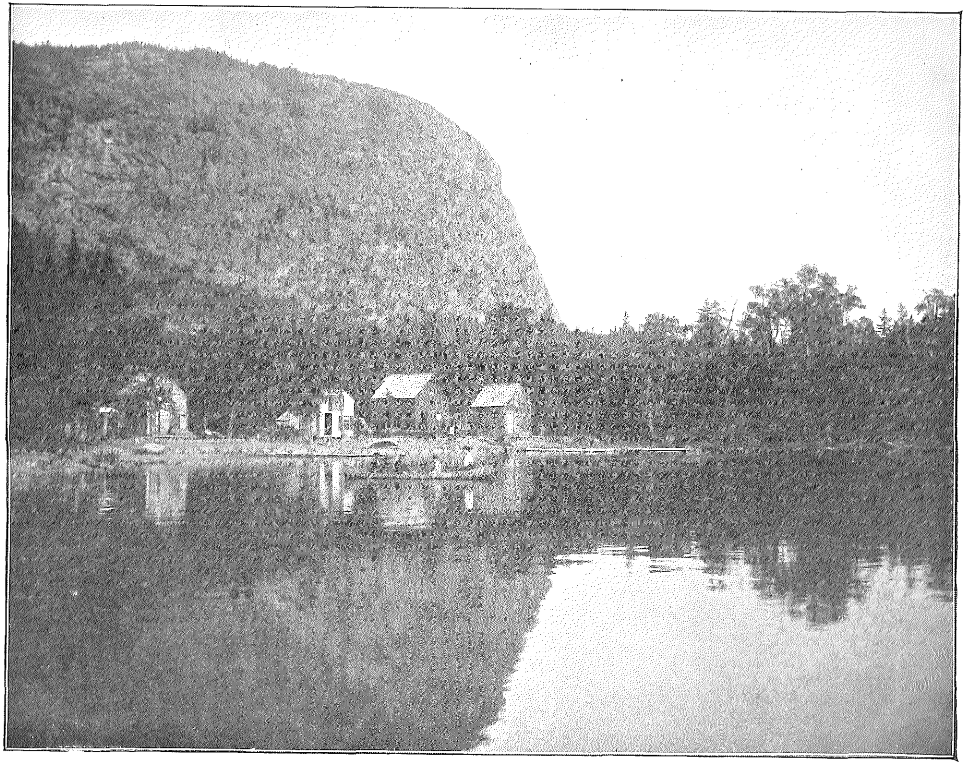
By Prof. CHARLES D. WOODS.

(This paper is the record of experiments, as yet unpublished, made by the Missouri Experiment Station. Prof. Woods acknowledges his indebtedness to the same for the facts obtained.)

It is universally admitted that the standard narrow tired wagon wheels are among the most destructive agents of our streets, macadam, gravel and dirt roads, and to the fields, meadows and pastures of our farms. It is also generally known that wide tired wheels cost little more than those now commonly used, and that these wide tires will in most cases prove positively beneficial to the roads. Despite the fact that a number of careful tests have shown that the draft is less when the wide tires are used, these results have not been accepted as conclusive and final by the public, and there yet remains in the minds of even intelligent farmers and teamsters a well defined and positive conviction that the wide tire will draw very much heavier over roads in what we might term average condition, and that in mud the wide tires would draw so much heavier as to preclude their use.

To secure reliable information on these points Prof. H. J. Waters, director of the Missouri Experiment Station, undertook to make careful comparisons of the draft of one and three-fourths inch and six inch tires on dirt, gravel, and macadam roads in all conditions. It was proposed to have these trials cover an entire year, so as to be certain that they embraced all conditions of road surface usually found. This work was begun early in January of 1896, and has continued without interruption or unfortunate accident up to December, 1896. The tests were made with a Giddings self recording dynamometer registering a maximum strain of 2,000 pounds, and reading to about five pounds.

The narrow wheels were standard width—inch and three-fourths tire—such as are made for the ordinary three and one-



SCENE AT MOOSEHEAD LAKE.

fourth wagons. The wide tired wheels were metallic, with six inch tires cast to fit the spindles of the wagon purchased with narrow tires. Nearly all trails were therefore made with the same wagon in all cases, with the same load—one ton—the wheels being changed.

Both sets of wheels are of the same height.

At least once each month the readings of the dynamometer were carefully compared with those of tested Fairbanks scales. The minimum length of run was 300 feet and return. In many cases this was increased to 400 to 600 feet. By averaging the draft of the round trip the difference in level in the surface of the road was neutralized, and the average draft here reported is that of a perfectly level stretch. Care in all cases was exercised to have the speed of the teams uniform, about two and one-half miles per hour.

SUMMARY OF RESULTS.

I. Macadam Street.

Hard, smooth, nearly level, and free from dust, loose stone or sand:

	Trial made Sept .12. Average draft.	
Narrow tires	143.5	lbs.
Wide tires	123.4	"
Difference in favor of broad tires	20.1	"
Percentage difference	16.3	

II. Gravel Road.

(a) Hard surface, no ruts, some loose stones size of black walnuts. Trial made Oct. 12th.

	Length of run.	Average dratf.	
Narrow tires	400 feet	218.4	lbs.
Broad tires	400 "	163.8	"
Difference in favor of broad tires		54.6	"
Percentage difference		33.3	

(b) Same as (a), except there was a large quantity of sand in the gravel which prevented it from packing perfectly. Road dry and free from ruts. Run made Aug. 29, 1896.

	Length of run.	Average draft.	
Narrow tires	400 feet	239.1	lbs.
Broad tires	400 "	156.7	"
Difference in favor of broad tires		82.4	"
Percentage difference		52.5	

(c) Same as (a) except that road was wet, water standing on surface. Loose sand varied in depth from 1 to 2 1-2 inches. Wide tire forced most of the slush out of its track. No water remained. Trial made Oct. 12, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	262.3 lbs.
Broad tires	400 "	268.1 "
Difference in favor of narrow tires		5.8 "
Percentage difference		2.2

III. Dirt Road.

(a) Dry, hard, free from ruts and dust, nearly level. Trial made Aug. 28, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	137.3 lbs.
Broad tires	400 "	104.8 "
Difference in favor of broad tires		32.5 "
Percentage difference		31.0

Trial made Sept. 12, 1896.

	Length of run.	Average draft.
Narrow tires	1,000 feet	178.4 lbs.
Broad tires	1,000 "	145.3 "
Difference in favor of broad tires		33.1 "
Percentage difference		22.7

(b) Muddy on top, firm underneath. Mud about 2 1-2 inches deep, very sticky, adhering to the broad wheels. Soft enough to allow the narrow tires to cut through to solid ground with slight friction. Trial made Oct. 12, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	250.8 lbs.
Broad tires	400 "	325.3 "
Difference in favor of narrow tires		74.5 "
Percentage difference		29.7

(c) Clay roads, wet and sloppy on surface, to depth of 3 1-2 to 4 inches. Hard and dry underneath. Both wagons cut through mud, no ruts left. Trial made Oct. 13, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	286.5 lbs.
Broad tires	400 "	406.3 "
Difference in favor of narrow tires		119.8 "
Percentage difference		41.8

(d) Clay road, dry on top, but spongy underneath. Ruts in road before making trial, about 8 inches deep. Both sets of wheels run in the old ruts, narrow tires first. Ruts about 5 inches deep after broad wheels had passed over them once. Trial made Feb. 24, 1896.

	Length of run.	Average draft. 1st run.	Average draft. 2d run.	Average of both runs.
Narrow tires	400 ft.	621.0	586.2	603.6
Broad tires	400 ft.	459.6	327.2	393.4
Dif. in favor of broad tires		161.4	259.0	210.2
Percentage difference				53.4

(e) Same as (d) except that a new track was made, the narrow tires being run first, the wide tires running over the rut cut by the narrow tires. Depth of rut made by narrow wheels, from 8 to 12 inches. Rut of wide tires 4 to 6 inches deep. Trial made Feb. 28, 1896. Two runs.

	Length of run.	Average draft. 1st run.	Average draft. 2d run.
Narrow tires	400 ft.	466.7	478.5
Broad tires	400 ft.	489.5	356.3
Dif. in favor of broad tires		22.8	122.2
Percentage difference		4.7	34.3

(f) Clay road; muddy, but frozen on top, not enough to bear load on either set of wheels. Horses broke through frozen ground in some places. Narrow tires made ruts 12 inches deep in places.

	Length of run.	Average draft
Narrow tires	400 feet	549.0 lbs.
Broad tires	400 "	447.6 "
Difference in favor of broad tires		101.4 "
Percentage difference		22.5

(g) Clay road, very soft and sticky; old ruts 18 inches deep, full of water. Narrow tire run first. Broad tire cut about 6 to 8 inches deep, and gathered the mud, filling the wheel. Trial made April 9, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	321.7 lbs.
Broad tires	400 "	514.1 "
Difference in favor of narrow tires		192.4 "
Percentage difference		59.7

IV. Mowing Lands.

(a) Timothy sod. Dry, firm, smooth, freshly mown. Narrow tires cut ruts 3-4 to 1 inch deep. No appreciable depression by broad tires. Trial made July 2, 1896

	Length of run.	Average draft.
Narrow tires	400 feet	317.3 lbs.
Broad tires	400 "	228.8 "
Difference in favor of broad tires		88.5 "
Percentage difference		38.6

(b) Timothy sod. Grass and stubble about 3 inches high. Ground soft and spongy. Narrow wheels cut ruts 5 to 6 inches deep. Broad tires made ruts 1 1-2 to 2 inches deep, doing almost no damage. Trial made April 9, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	569.1 lbs.
Broad tires	400 "	323.6 "
Difference in favor of broad tires		245.5 "
Percentage difference		75.8

(c) Timothy sod, same as (b). Each set of wheels was run in its own track twelve times before reading was taken. Rut cut by narrow tire 12 to 15 inches; by broad tire, 4 to 5 inches. Trial made April 9, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	876.0 lbs.
Broad tires	400 "	397.9 "
Difference in favor of broad tires		478.1 "
Percentage difference		120.0

V. Pasture Land.

(a) Blue grass sod, smooth, dry, firm. Neither wheel cut an appreciable rut. Trial made Sept. 12, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	195.8 lbs.
Broad tires	400 "	154.8 "
Difference in favor of broad tires		41.0 "
Percentage difference		26.5

(b) Blue grass sod. Dry, firm, smooth. No appreciable impression made by either set of wheels. Trial made Oct. 13, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	239.5 lbs.
Broad tires	400 "	157.0 "
Difference in favor of broad tires		82.5 "
Percentage difference		52.5

VI. Stubble Land.

(a) Grown in cow peas the previous year; ground soft. Narrow tires cut ruts 14 inches deep first run. Broad tires cut ruts about 3 to 4 inches deep. Four horses were necessary to pull the narrow tired wagon. Trial made Feb. 8, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	758.1 lbs.
Broad tires	400 "	538.7 "
Difference in favor of broad tires		219.4 "
Percentage difference		40.0

(b) Corn stubble, free from weeds, nearly dry enough to plow. Surface smooth and nearly level. Trial made March 27, 1896.

	Length of run.	Average draft.
Narrow tires	400 feet	484.2 lbs.
Broad tires	400 "	325.7 "
Difference in favor of broad tires		158.5 "
Percentage difference		48.6

(c) Same as (b). Draft record taken on 14th run in same ruts, each set of wheels being run in its own track. Depth of rut—narrow tires, 7 to 12 inches; broad tires, 2 to 3 1-2 inches. Trial made March 27, 1896.

	Average draft.
Narrow tires	427.0 lbs.
Broad tires	263.3 "
Difference in favor of broad tires	163.7 "
Percentage difference	62.2

(d) Corn land, dry, firm, level, and smooth. Reasonably free from weeds. Trial made Sept. 12, 1896.

	Average draft.
Narrow tires	343.1 lbs.
Broad tires	225.4 "
Difference in favor of broad tire	117.7 "
Percentage difference	52.2

VII. Plowed Ground.

(a) Not harrowed. Many large clods; surface rough. Large clods crushed by wide tires. Narrow tires pushed them aside. Trial made Sept. 12.

	Average draft.
Narrow tires	509.9 lbs.
Broad tires	382.6 "
Difference in favor of broad tires	127.3 "
Percentage difference	33.2

(b) Same as (a), except ground prepared for seeding. Surface smooth; fairly compact; fine tilth.

	Average draft.
Narrow tires	466.5 lbs.
Broad tires	323.2 "
Difference in favor of broad tires	143.3 "
Percentage difference	44.3

CONCLUSIONS.

Summing up all the trials made in Missouri and elsewhere the results appear to warrant these conclusions:

I. On all conditions of mowing lands, pastures, fields (covered with weeds or bare, plowed or unplowed) the draft where broad tires are used is materially less than where narrow tires are used, the difference ranging from 26 to 120 per cent. It is probable that on the average much more than half the annual farm tonnage is hauled over these surfaces.

II. On macadam and hard gravel roads comparatively free from loose stone there is a slight advantage in draft from the use of the broad tires.

III. On dirt roads in all conditions from dry on the surface to dry and hard, the broad tires show a materially lighter draft than do narrow tires. When very soft to a great depth the wide tires appear to draw very much lighter than do narrow tires. When the road has dried enough to render the walls of the ruts rigid, and deep ruts have been cut with the narrow tires and opened sufficiently to make the friction on the sides of the narrow tires small, the advantage is in favor of the narrow tires. The number of trips over this road with broad tires before these ruts would be filled sufficiently to reverse these results would, of course, vary greatly with the character and condition (degree of dryness) of the road material and has not been determined. It should be borne in mind that if the majority of the wagons passing over this road had been provided with broad tires, this condition of the road could never have existed. There are two conditions of the dirt road in which the broad tires show to a disadvantage, viz: When the surface is too wet, soft, or sloppy to compress under the broad tires, underlaid with a hard dry stratum. Here the narrow tires cut through this soft mud and slush with much less friction than the broad tires.

In the nature of the case this condition of the road surface is of short duration. If the rains cease, a few hours in the spring, summer or fall, will dry this material so that it will compress and pack under the broad tires, enabling a given load to be drawn over its surface on broad tires with very much less draft than on narrow tires. If the rains should continue, this substratum is softened, the narrow tires cut deeper ruts, resulting in a greatly increased draft in comparison with the broad tires.

Another condition of the dirt road surface favorable to narrow tires, as shown by our trials, is when the mud is deep, but stiff and sticky enough to gather in the broad wheels. Ordinary roads are not found in this condition many times during the year, and they do not remain in this condition many days at a time. Since January 10th, last, a stiff, sticky, clay road having poor drainage, upon which many of our trials have been made, has been in this condition but once, and that lasted less than a week.

In deep dust no trials have been made.

S. H. Goodwin—I wish to say a few words in regard to this matter of woolen goods which the Secretary has mentioned in his report, as to the action which has been taken by the farmers in our county. When I say by the farmers I mean the farmers acting through the Granges. I have not had an opportunity to get any instruction from our farmers through the agency that elects the members of the Board; you know it is difficult to obtain any formal instructions from them. But the Pomona Grange in our county, at some of its summer meetings, saw fit to bring up this matter as to what the Granges in the county would recommend to this legislature in the way of amendments to any laws or the enactment of new laws, and a committee was appointed consisting of one member from each subordinate Grange in the county. At the annual meeting of the Pomona this committee was present, and among other recommendations which they made was one in relation to the inspection of cloth. I haven't that bill before me, but it has been reported to the legislature, and has been referred to the committee on manufactures. What the outcome of it may be I do not know. The object of this bill is to tag each piece of cloth so that the person buying may know exactly what the per cent. of shoddy is in the cloth. I was not aware at the time this came up that the Secretary of the Board was pursuing that line of investigation, but it seems that he has done so to some extent. You can all judge for yourselves as to what the chances will be of getting through such a law, and as to the desirability of it. I only know that our county formerly was the leading sheep raising county in Maine. I do not know how the figures stand at present, but I do know that the industry is depressed, as you all understand. I shall not go into any recapitulation of the causes which led to this, but our people feel as though a law of that kind, especially if it were made uniform throughout the whole country, would be of great benefit. Some go so far as to say that it would be of more benefit than any tariff which we would be likely to get. Our people feel like pressing a bill of this kind, and also some other matters. One resolution was adopted by the Pomona Grange looking to the improvement of our country roads. It recommended the abolishing of the tax commonly known as the highway tax, to be raised in labor and material. It was the unanimous sentiment of that meeting that the taxes for the maintenance of roads should be assessed in cash. Nothing was said about any other legislation in regard to this matter, leaving the law just as it is in relation to road commissioners and highway surveyors. We were also interested in the seed question, and some other matters.

E. E. LIGHT—Mr. President: In regard to the matter of roads, I am going to offer two resolutions, in order to put the matter in some definite form before the Board. They are as follows:

Resolved, That any legislation compelling increased money taxation for highway improvements is believed by this Board to be premature at present, and will unwisely increase the burdens, already too heavy, of our rural communities.

Resolved, That better expenditure of present means, and improvements on highways optional with towns or counties, are better adapted to our conditions than State expense and control.

MR. MOODY—It is a fact that I have done a great deal of work on highways, and you will probably believe that it is a fact when I tell you that I do not mean to do any more. I ride a great deal, and have as much interest in the roads as anybody, and I am always thinking what terribly rough roads I am riding over, and have thought a great deal about some method of improving them. But whenever you start out in any direction to make a radical change in road building, you have to meet this one objection—expense. I presume you are as well aware as I am that the country generally is poor, and the people would not consent to anything that would add to the burden of taxation, or take more money from their pockets, and you could not get it through the legislature. And furthermore, I believe that the trouble does not lie exactly there. It is somewhere else, and in a place where we cannot very well reach it. I have been one of the selectmen of my town for eleven years, and it has always been the custom for one of the selectmen to have charge of the money—to lay out any money when we take it out of the treasury. I used to take the highway tax, and mix it with the cash, so to speak. I would go on to a location, and there would be perhaps $50 in unpaid highway tax. I would hire a good man or two, because I might need a team which I could not get in the district, and I would spend $100 there; and I would just as soon have the highway tax as to have the cash. We paid 66 cents in money for a dollar in highway tax. That dollar in highway tax is just as good to me as 66 cents in silver or gold. It is not the method so much as the manner in which you apply it. In order to have good country roads, I mean a good road bed thrown up and all the stones taken out so that it is a very good road, all we need is to have some men who are competent and willing to go on and do the work. The greatest trouble that we meet with, so far as I have ever seen in my section, is the small stones in the highways, and the cost of getting them out is very slight. The law says that the surveyor shall in certain months go over the road and remove the small stones. It costs but little and it adds very greatly to the ease with which you can get over the road. The fact is, the surveyor does not go over the roads more than twice a year. The law says that he shall do it, but there is no penalty attached, and sometimes he says that he has not the money to do it with. Now if you make an amendment to that law, and oblige him to do it, provide that if he does not do it he shall be fined, and that the selectmen shall pay the bill if he has not the money, then you meet one of the greatest troubles that we have to deal with.

Sometimes the surveyor would do this if he had the means, and sometimes he is a man that is not qualified. It is hard work to get men who are qualified. You may make all the laws you please, and you will not make men. If I were to suggest any amendment to the present law, I would leave the method optional with the towns, as it is to-day, and then I would oblige the surveyor to remove the stones every month for seven months in the year, subject him to a fine if he did not, and provide the method of imposing the fine. I would give him the authority to do this, and would oblige the selectmen to pay the bill. I believe that there is nothing that we could do which would do so much good as that. I think it would make the roads quite comfortable for us to travel over. We do go on and remove the large stones and fill up the ruts, and generally the roads, with the exception of some pieces three or four miles long on which nobody lives, are very good, except for these stones which you are always rattling over, and but very little expense is needed to remove these. We cannot build stone roads, it is of no use to talk about that. All the professors on earth, all the philosophers, and all the financiers may talk about it, but we cannot do it, we haven't the money. What can we do and what shall we do? If you oblige the towns to raise the tax in cash, and do not adopt the methods that I speak of, you would then be laboring under the same difficulties that you are now. I think that towns, if they were obliged to pay the money, would raise small taxes, and I do not know but the roads would be worse than they are now. If we want to improve them, I would recommend that this Board draft an amendment as I have suggested, and I believe it would be likely to be enforced. I, myself, would oblige the surveyors to do this in my own town, and I do not know but I would in the surrounding towns. I would not ride over the stones if there was any way in which I could help it.

Ques. If we had such a law would it be any advantage to have in our counties commissioners or surveyors to see that the law was enforced?

Ans. I hardly think it would. I think there would be men enough in the towns who would have an interest in it and see that it was enforced. I always pay my tax in money, and I would not put my money out for roads and then ride over these stones if I could help it; and there are ten, and perhaps twenty, men in the town who pay their taxes in money, and would feel the same. I do not complain of the crossways or bridges. The towns do not dare to neglect these, because it would expose them to an action of law if anyone should be injured. And if there are any large stones, or logs thrown up, they are taken out. The roads would be fairly good if we did not have to contend with these small stones.

Ques. Which would you rather have, labor at $1.00 or $1.00 in money, taken on an average through the town?

Ans. I would rather have a dollar in money; but my statement was that a dollar in labor was as good as 66 cents in money always for me, and that is what we pay in money, 66 cents on a dollar. The reason for this is that we fix the price of labor high. We have a shilling an hour—six shillings to the dollar, for men, and the same for oxen. We can hire men for less than this if we pay them cash.

Mr. Talbot—The only reason why I should favor a change in the law in regard to highways is simply this: In our own community, and I suppose it is true in all places, there are villages, and in those villages there is a large floating population, and we impose on each one of those men a tax, and we give that tax to some worthy farmer to expend. Now it is no trouble for this man to call out the farmers around, and get them to go on to the road to work. But he notifies a man in the village, who is a spendthrift and lazy and does not wish to work, and damands that he come on to the highway and labor. He gives him the proper notice and he fails to appear. All there remains for the surveyor to do is to notify him again, and if he does not come, the tax, at the end of the surveyor's term, is carried to the selectmen, and they put it into the money tax. The farmer is obliged to make the repairs, while the man who has the benefit of the road for his bicycle, and in all other ways, does nothing whatever, and gets rid of his tax. I believe these burdens should be borne by us all equally. If I say, "Yes, I will be there," and break my word and do not go, and the next year the surveyor carries in the tax, the selectmen will say, "What is the use of taxing him?" The taxes are assessed in April, and th surveyor generally waits until the next May before going to the selectmen; and if they do not see fit to make a supplementary tax, I am dropped out. And whereas the town has raised, as it supposed, $1,000 in labor, it has perhaps got $800 on its highways. I do not believe in adding any more burdens; I think that if the money were judiciously expended we have enough. But we ought to have men on the road that understand the business of road making. A road maker is as essential as a blacksmith, or a mechanic of any kind. The appointment does not make a man a road maker. I believe it is an art that needs to be studied, and farmers must wake up to this fact.

MR. DUDLEY—Some towns up in our county raise their tax in money, and at the same time if a farmer wants to go on to the road and work out his tax at cash prices, say fifty cents on a dollar, they give him a chance to do it. In that way you get the money from those fellows that are around the villages, that you might call loafers, and the farmer who is willing to work pays his tax that way. They have done that way in Presque Isle, and it works well. But they usually get the best men they have in town to superintend the building of the roads. I think that in many towns it is almost impossible to get men who have any interest in the matter, or if they have interest they do not know how to build a road. If we could have a good man to superintend the building of the roads in the different districts, even if he should superintend the laying out of the statute labor, and we should pay him for it in cash, I think we could get a great deal better roads than we get now, under the same system.

Ques. Do you think fifty cents in money is better than a dollar in highway work?

Ans. I think it is fully as good.

Ques. As a general thing do not the farmers who go on to the roads do a good day's work?

Ans. Some of them do.

Q. Are not their wages worth a dollar a day in any place?

Ans. Oh, yes. But we let them go on to the road and work by the hour as long as they like, and our farmers generally work out their tax in that way, at fifty cents on a dollar in cash. If the tax is raised in cash we do not raise as much money for the roads.

Speaking of the stones,—a new road was built through to Ashland, from our place, and it was full of small stones. Every one who went over it said it was the roughest road he ever drove over. I had the handling of it, and went on and took the stones all out, and you would not have believed the difference it made; and we laid out but very little money. A couple of men with picks and crow bars will clear out a large piece of road in a day. I was surprised to see what a great deal of benefit we got from a little money, in that way. I think that as a general thing, if the stones were taken out the roads would not seem nearly as bad as they do now.

MR. HINCKLEY—I go through Washington county twice a year, and I agree with Mr. McKeen that we have the best roads in our section of any part of the State which I have been in. They turnpike the roads in good shape, remove the rocks, and drain off the water. That, in my opinion is all that we can do. As to having macadamized roads in our town, we cannot do it. The drainage, in my opinion, is one of the principal things. Provide a way for the water to run off as soon as it falls, and the road is not going to soften up as badly.

Ques. Have you had any experience with road machines?

Ans. We use two machines, and I consider that the best way; but it depends a great deal on the man that manipulates them. If he understands his business you can build a beautiful road, and that is the way the roads are built in Washington county.

Ques. What has your experience been as between the cash and highway system, so called?

Ans. We do better with cash than we can with labor, although we formerly used labor. Under the labor system, if a man was deficient in paying his tax it was returned as deficient and went into his next year's tax.

Report of committee on pay roll read and accepted.

MR. LIGHT—This matter of road improvement has been presented to the Board, and it is recommended for action by the secretary. By the program that has been arranged considerable attention has been drawn to the question of roads, and whatever we do here will be incorporated in the agricultural report, and it seems to me that we should place ourselves definitely before the farmers of the State, so that they will know our position in regard to this important matter. The first resolution refers to the matter that is so often spoken of in the papers; and if I mistake not, not long ago a bill was introduced into the legislature to the effect of classifying the roads and having an office established here at the Capitol, and other provisions with which I am not familiar. I have been told that an effort might be made similar to this at the present session of the legislature, and it is with that fact in view that this resolution, worded as it is, has been presented to you.

I am aware that we are not a law making body; we simply recommend, we have nothing else to do. Therefore I am in favor of making such recommendations that, when we go back, we can face our constitutents. I am not in favor of recommending large appropriations that would increase the taxation which, at the present time, we know is burdensome to the rural communities. I am glad to see this discussion, and hope the matter will be fully discussed.

Committee to consider whether it would be advisable to hold a field day at Old Orchard, or in connection with the field day at Orono, appointed by the Chair, as follows: B. W. McKeen, Nahum Hinckley, John F. Talbot.

MR. GOODWIN—I can hardly say that I want to vote for those resolutions as they are, because in my county the farmers are in favor of abolishing this highway clause in the law. I think Brother Moody's suggestion is an excellent one, as to attaching a penalty to the failure to remove the stones. Our people do not want to change that, they simply want the tax to be raised in cash, so that when a man works on the road he shall get fair pay for his labor; and also that the money that is paid by a few tax payers in the villages can be distributed over the town in the places where it is needed, which cannot be done under the present system. One year ago last summer, Mr. Merrill, who is chairman of the committee on agriculture, was chairman of the board of selectmen of our town, and I appeared before them and asked them to try to put some money on the road above my place; I had three miles of road to keep in repair. When they sent me the books with the credits taken out for the work, I had seventeen dollars to repair three miles of road. I asked why they did not take out some of the taxes of others and put in here, and they said that they had no more money in other places than they needed. I believe that the resolution which I presented and which has gone before the legislature, would be for the benefit of the farmers in Maine. In order to collect this highway tax you must observe all the statute requirements. The notice must be given, and all the necessary steps taken, else the tax cannot be collected the ensuing year. And my observation has been that where a man stands out and does not go on to the road to work, in many cases he escapes taxation, so far as his highway tax is concerned. I think we have had a fairly intelligent board of selectmen,—it has been the same in other towns. And I believe that while this law was wisely intended, and was a good law years ago, the necessity for it does not exist to-day, and it would be better in three-fourths of the towns to have the cash system. The town of Winthrop has had this system for twenty-five years, the towns of Madison and of Skowhegan have adopted it; and why not make it a law. Here is a town with six miles of good roads, under the cash system, and here is another town with five miles of poor roads, under the highway system. In hauling a load through these towns you have to measure your load by the poor roads through which you have to pass.

Voted to lay the resolutions upon the table until Thursday A. M.

Adjourned until Thursday, at 9 o'clock A. M.

THURSDAY, JANUARY 21.

Meeting opened at 9.45. Records of Wednesday's meeting read and approved. The first resolution presented by Mr. Light in the Wednesday afternoon session, and laid upon the table, was now taken under consideration.

S. H. GOODWIN—I wish to present as a substitute for this resolution one to which I think there ought to be no objection. I do not know that Mr. Light would object to it, he rather assures me that he would not. This is a resolve which our Pomona Grange passed after a full discussion, and is as follows:

Resolved, That the law which permits the repairing of highways by a highway tax is an unequal and wasteful expenditure of public money, and should be repealed.

Resolved further, That all necessary expenses for building and repairing highways should be raised in money, the same as other expenses, and that one assessment shall cover the expenses and apportionments.

This resolution has been referred by both the Senate and the House of Representatives to the committee on agriculture.

I believe that in regard to these road matters, and in making any improvements, this goes to the root of the whole difficulty, and the resolution presented by Mr. Light, as it is worded, whether intentional or not, would seem to work against this. I understand that of the replies which Mr. McKeen received for his bulletin on Good Roads, nine-tenths, perhaps ninety-nine one hundredths, were in favor of just such a resolution as this. If we pass Mr. Light's resolution it would seem to cripple, and almost destroy, any chances for legislation in the right direction this winter. You will understand, gentlemen, that any measures which you may adopt here would have great weight with the committee to which these matters are referred. I know from conferences with the committee on agriculture that they would not favor the resolution now before us. I do not believe there is any member of the committee on agriculture, or the committee on ways and bridges that is in favor of any State expenditure for road commissioners, or anything of that kind. I think they would be perfectly willing to let the second resolution go through, but it does seem to me that it would be unwise for this Board to pass that resolution in its present form.

Mr. Holbrook, who is a former member of the Board, has introduced a bill into the legislature relating to highways, and he would like to present it to the Board, and confer a little with the members, before they pass any formal resolution in regard to this road question. It is an important question, and has been before the Board for a long time as you know from the reports. This resolution which I have, would make the system equal all through the towns, and for that reason I am in favor of substituting it for the first resolution presented by Mr. Light. I think our people in Somerset county would be just as much opposed at this time, probably, to any State commission, or any measure of that kind as Mr. Light or any person in this room. I do not think that the second resolution would conflict at all with mine, but I do believe that this is a worthy law and goes to the root of the whole matter, and I think the Board of Agriculture should start in the right direction.

I understand that the committee on agriculture would like to meet the Board, and before we adopt the resolution before us I think we should have a conference with them, and have a better understanding.

Mr. Talbot—I do not know that I have any objection to the resolution, but I do object to the system of highway labor now on our statute books that allows people to work out their taxes, for the reason that was brought out here yesterday. It was admitted by members of the Board that fifty cents was equal to one dollar in labor. It seems to me that that fact is convincing proof that the money will go farther than the labor will, and why have on our statute books anything of the kind? If towns must raise $1,000 under this system, when $500 will do just as well, why not abolish the system?

If a gentlemen wishes to pay his tax in money he wants to know that the money is actually expended on the highway. He doesn't want it to be used to buy a barrel of flour. I do not know that anything of that kind ever happened, but circumstances point that way. When money is paid, the man that pays it has not the confidence that the road actually gets any part of that money. Under the system of road commissioners the statutes require that whoever is to expend the money shall give bond for the faithful discharge of his duties. It seems to me that under the labor system you have no such obligation. A man merely notifies another of his tax,—gives him a notice of forty-eight hours, and that is sufficient in point of law. If he fails to appear it is carried into the next year's taxes, and by some omission or some neglect it does not get on to the books, and consequently it is dropped entirely, and the roads lose that money. It seems to me that if we should just abolish the word labor, in that clause that allows the tax to be raised in labor, and let it be optional with the towns as to a commissioner or surveyor, in the expenditure of the money, it would be much better for this Board to go on record as sustaining a movement of that kind.

MR. SKOLFIELD—In our town and adjoining towns the tax is almost all paid in money; but where it is paid in labor, it is put on to the poll tax, and a man that pays a poll tax pays $3.00 for other purposes and $1.50 for the roads. Take that off and pay the tax in money, and it makes about three-fourths of a mill additional for the people who have property, and those men who have a poll tax do not pay anything. That is the reason why many of these towns prefer to have labor. We have perhaps 200 men who pay poll taxes, and it gives us $300 additional. When you come to the money system, the additional amount is put on to property, and those men who use the road as much, practically do not pay anything. We use the money system, and it is very unsatisfactory that way, and the labor system is unsatisfactory. I do not know of any satisfactory way in summer but to have a road commissioner and have him repair the roads. This does well enough in summer, but what are you going to do in the winter? Our town has forty miles of road, and it drifts badly in many places. If you have road commissioners, with a gang of eight or ten men in summer, then people will say, you must keep the road open in winter. We are not going out to expose ourselves to this cold weather. You must shovel it out yourselves, and if you do not come out we will complain of you. I have had sixteen years' experience on the road in all kinds of ways. I am not satisfied with the present law, and haven't seen any with which I am satisfied.

MR. LIGHT—I see that this resolution is not understood as I originally intended that it should be. I am informed that there are likely to be efforts made to pass a bill to establish a State officer, and call for a large appropriation to institute, or begin to make in some section of the State, macadamized roads, modern turnpikes, or something of that kind. This would call for a large appropriation; if not at first it would ultimately, and all such movements I believe emanate largely from parties who have no particular sympathy with the agricultural communities of the State of Maine. And I desired to place the Board as definitely as I could in relation to that matter, so that those people would think that we were conservative in regard to it, and that any improvements in our road system, so far as we have any influence, would begin from the farmer's standpoint. Perhaps if I had introduced the word largely, so that it would read, "Any legislation compelling largely increased money taxation" it would have been clearer to you. And also I intended to leave an opening in the second resolution whereby such a resolution as has been read would be admissible, where it says, "A better expenditure of present means." I am aware of the great loss and misuse that there is under the labor system. I have always lived in a town where it was practiced. But if we change to the wholly cash system I cannot see but that there will be serious difficulties then. I take into consideration the great number of towns that we have that are strictly rural communities, that have long distances of highways to keep in repair, with a sparse population and a small valuation; and that those roads must be maintained wholly by the communities through which they run. But I believe that under the present condition of business and prosperity of the great mass of the farmers of the State, it would be unwise to increase the cash taxation, and I am not ready to go before those that I represent here as in favor of increasing their burdens in that manner. Here is the matter of the winter breaking of the roads, here is the matter of collections, and here is the matter of the poll tax, which the member from Sagadahoc has mentioned, that would have to be met. And another thing,—if you change to the cash system are you sure of any better expenditure of that cash than you are with the labor system? These are considerations that we ought seriously to consider before we commit ourselves to any definite line of work.

Mr. Goodwin—In our town the claim is made that the highway system, the so called labor system, is for the benefit of the poor man. But I have always argued that if a man is poor he can pay one tax better than he can two, and under the system that I have outlined the poor man would have only one tax. Of course in all such circumstances as Mr. Skolfield delineates you can easily make the poll taxes the maximum sum which the statute gives. Now in the rural communities the poor men claim sometimes that they can work out their taxes better, but if they must pay a poll tax of three dollars and then work out a tax of $1.50 besides, you are certainly working to the injury of the poor class. My judgment is that taking the State at large, this bears more equally upon the poor men than the other.

So far as commissioners are concerned, or expenditure by highway surveyors, I do not think that this troubles that law at all, so that it would be necessary to repeal that. All our people ask is simply to drop out that clause which leaves it optional with the towns to adopt either of the ways provided by the statutes. We do not propose to revolutionize the whole system, but we would like to fix it so that it would be uniform throughout the State. In my own town I know that it works very unequally, and in towns around. The larger villages are inclined to hold that highway tax, when it is raised in labor and material, within their limits, and we have nothing in the outskirts to work with. There is no way, so far as I know, in which the selectmen can rectify it. You cannot take a rich man's tax and carry it off into some poor district. But in this system it falls equitably upon all. If a town desires to employ commissioners it can do so, or it can hire these men. If a laboring man goes out to shovel snow I know of no reason why he should not have his pay. What method is there by which a man can get his pay after the tax is worked out? Ninety-nine one-hundredths of the selectmen in Maine will tell you that it is almost impossible to collect an old highway tax, as ordinarily assessed, according to a notice given by a surveyor. Certainly I believe that resolution number one, as put in by Mr. Light, is contrary to the spirit and wishes of those who are working for the interests of agriculture, outlined as they are in the bulletin issued by Secretary McKeen. I certainly believe that it is for the interests of Maine to adopt this resolution of the Pomona Grange of Somerset county.

Mr. Wheeler—This matter was brought up yesterday and discussed perhaps to the full extent. I did not get it all because I was not in the room all the time. It is a question which has not only been discussed at every fireside in the rural portions of our State and at country stores and post offices, but at town meetings and larger gatherings of people. And while I do feel that the present highway system is wholly against the better building of our roads, yet I do not know as we are in any wise fitted, at present, to take any action in any different line. Let me explain to you the method that we have adopted in our section for the last two years, with very good results. We were dissatisfied with the raising of our tax in labor, and did away with it, and the tax was all raised in money. Then the selectmen, or road commissioners, which we made them, apportioned to the old highway districts a certain amount of money for the maintenance of the roads for a year, and appointed in each district the man who they thought was the most capable, to expend that money, and every tax payer had the privilege of working out a certain part of that tax. If a man was busy and did not care to spend his time they hired some one else to do it. And to-day our roads are in better shape than they have been for many years. Yet we have not had any bad winters to contend with since this system was organized, and it may be that the heavy snows of a hard winter would change the matter altogether.

I should wish that this Board might go on record against the highway labor system, and against a State road commission with large expenditures of money.

Mr. Moody—I think we have all made up our minds on this question,—every man knows just what he is going to do. I cannot influence anybody if I want to, and I do not want to, and it seems to me that we had better get right down to business. If we had a compulsory labor system in the State then I would be all ready to make a change. But we have an optional system; every town can have the money system or the labor system, as it chooses. Isn't that all that we need? What can you ask more than to do just what you have a mind to. Every town can do that now. If a town wants to change its system, it has the privilege of doing it, under the present law. I do not see what more we can do for them. Is it right for us to endorse a measure that compels them to take up a system that they do not want to adopt?

That is the way I look at the matter, and I think we had better get a vote, just as soon as everybody has expressed his ideas.

MR. MCKEEN—I certainly do not wish to enter into this discussion at all. I would like to remind the Board, however, that there is going to be quite a movement looking towards better road laws in the State, and that all classes of our citizens are interested in this movement. Of course we are looking at it from different standpoints. We must necessarily look at it from the standpoint of the farmer, but there are other organizations besides the Board, and other interests besides the agricultural interests, looking at the same matter, and looking at it from their standpoints. And in order for us to do anything we must be united. The Board of Agriculture by itself alone can do nothing, if other interests are antagonizing us, and have measures of their own that do not fully agree with ours. Before the Board goes on record with anything that looks like obstructing legislation, or favoring any particular form of legislation, I wish we might know what other classes are doing. I have had this bill handed me by Mr. Fletcher, from Col. Bangs, president of the Augusta Board of Trade, and I understand that this board of trade is using all its influence, united with the influence of other boards, to obtain a passage for the bill, or one similar to it. If we go into this matter each with a separate, pet scheme of his own, I am afraid the whole thing will fall through, and I wish we might know something about what other organizations are doing, and get at something in a concerted manner before placing ourselves on record.

Through Washington county and portions of Hancock county there are long stretches of road where the territory is very sparsely settled; in fact, there are miles and miles of woods, with no habitations. And although I know nothing about how the road is maintained I know that they have a good road. And I venture to say that the road is kept in repair by the money system. I think the working out of highway taxes will work against rural districts and sparsely settled portions, rather than in favor of them, because it calls for such a wasteful and unwise expenditure of money.

MR. TALBOT—It seems to me that we are all united in one thing, and yet we are all a little at variance. I think if this matter could be left where it is until the proper resolution was before us we could come to an understanding, and I move that the matter be laid on the table until to-morrow morning.

Mr. Goodwin—A former member of the Board has already put in a bill, and if we present any resolution we want concerted action. We want to sift out the best from these measures, and try to agree. The committee on agriculture would like to meet the Board of Agriculture, and in discussing this matter perhaps we could arrive at some definite conclusion so that we would all be satisfied.

Mr. Light—The secretary has intimated here that some action was likely to be taken in the legislature upon this matter. He has mentioned the Augusta Board of Trade, and said that they were trying to introduce a bill, through boards of trade in the State. These boards of trade are located in the cities, and there are twenty cities and 419 towns in the State of Maine, and seventy-six organized plantations. Now are twenty cities in the State of Maine going to dictate a taxation policy on highways for the nearly 500 towns and plantations? That is what I am aiming at in this resolution. I want to know if this Board is in favor of the board of trade dictating a policy to these 500 rural districts whereby they call for a State road commissioner, or whether it shall be a system which is practicable to the rural communities. That was what I meant by this resolution, and I am still more in favor of its passage as I hear it discussed.

Motion by S. H. Goodwin that the resolution presented by him be substituted for the first resolution presented by Mr. Light. This motion lost.

Voted to adopt the first resolution.

Second resolution read, and on motion of Mr. Light, voted to adopt it.

Mr. Hunton—Why is it that these people who are pressing this resolution are so afraid to give us time. There seems to be a difference of opinion, and why not give us more time, if we are going to get some information that will assist us, later in the day. We have plenty of business to occupy ourselves with to-day and we shall find business for to-morrow. We have business to attend to to-day that interests the farmers fully as much as this road business, and it seems to me that we ought to have this time which we have asked for.

Mr. Moody—I am the last man in the world that wants to push anything or anybody. But I think that men who have lived in the country as long as we have ought to have our minds made up, and it does not seem to me that it would do any good to put the thing off until another day. It does not make any difference to me what the board of trade or any agricultural committee may say, I know what I think about the matter. If my vote was of vital importance somewhere I might vote differently, but my mind is made up as to what I think is the best thing to do. This matter came up at four o'clock last night, and everybody talked on it all he wanted to, and I asked that it might be left upon the table until to-day, so that we should have ample time for discussion. I do not think we are pressing it.

Votes by which the resolutions were adopted reconsidered, and the matter laid upon the table until Friday, at 8 o'clock A. M.

Report of the committee on feed inspection taken from the table. Voted to endorse the bill presented in this report.

PROF. WOODS—At the suggestion of the Board yesterday, I have drafted a bill amending Section 4 of Chapter 256 of the Laws of 1893 relating to fertilizers, and I would like to read the proposed act as I have it here: "Any manufacturer, importer, agent or seller of any commercial fertilizer, who shall deposit with the director of the Maine Experiment Station a sample or samples of fertilizer under the provisions of section two of this act, shall pay annually to said director an analysis fee as follows: Ten dollars for the phosphoric acid and five dollars each for the nitrogen and potash, contained or said to be contained in the fertilizer, this fee to be assessed on any brand sold in the State, and upon receipt of such fee and of the certified statement named in section two of this act, said director shall issue a certificate of compliance with this act. Whenever the manufacturer or importer of a fertilizer shall have filed the statement made in section two of this act and paid the analysis fee, no agent or seller of said manufacturer, importer or shipper shall be required to file such statement or pay such fee. The analysis fees received by said director shall be paid immediately by him into the treasury of said experiment station."

Voted to endorse this amendment.

Prof. Woods—Last year this Board passed a resolution relative to having some act to regulate the sale of agricultural seeds. A resolution of that kind has already been introduced into the House this year. After consulting with Senator Roberts, Mr. Wiggin and Secretary McKeen, and using as a basis a bill which has been introduced into the National Congress, I have drafted a bill which I would like to read here, for your criticism, your suggestions, and, if it seems wise, your recommendation for its adoption by the present legislature. It is framed as a seed control, not an inspection of seeds, because it does not seem as though we can, except in a very limited degree, make a seed inspection at the present time and do it intelligently.

I will read the act in sections.

Act read.

That embodies, as nearly as I found it possible in so short a time, all that the committee on agriculture, the master of the grange, and this Board, so far as I know, have definitely contemplated. It is not a seed control or seed inspection in quite the sense of the proposed feed inspection or the fertilizer inspection, but I think it is as near to it as we can with safety come at the present time. Two years from now, guided by the experience which we shall get under this law, I have no doubt but that some way of making a wise inspection will be decided upon. This makes a big step in advance, requiring dealers to guarantee the quality, purity and germination of their seeds, and provides fines if they do not come up to that. The way in which a man would get his protection would be, when he buys a quantity of grass seed, to save a sample; and if in any way he is dissatisfied with it, to send the sample to the Experiment Station. It would then be examined, and if found not up to the standard the report would be made to the secretary of agriculture, and the man would be prosecuted. It differs from the fertilizer law in that it does not impose upon the director of the Station the duty of going about everywhere and getting samples of seeds. That I do not think we are quite ready for.

Ques. Is there any similar measure in any other state?

Ans. No, sir. This is the first move, so far as I know, that is at all adequate, towards pure seed, in our country. There is something in Germany, but the conditions there are different.

I do not think that we are prepared to go beyond a tentative step,—make a trial,—and two years from now we can act more intelligently.

Voted to endorse this proposed act.

Voted that a committee on legislation be appointed by the Chair at its leisure.

Adjourned until 1 o'clock P. M.

Report of committee to consider the report of the secretary, read by Mr. Straw.

"Your committee appointed to consider parts of the secretary's report, and present the same to the Board, have attended to that duty, and offer the following:

That Prof. Francis L. Harvey be appointed to the position of entomologist and botanist of the State Board of Agriculture.

That any agricultural society allowing gambling in any form, or the sale of intoxicating liquors, on its fair grounds, without reasonable diligence in the suppression of these evils, shall be punished by forfeiture of its charter.

That a legislative committee be appointed by the Chair to carry into execution the recommendations of this Board.

That your committee corroborates the suggestion of the secretary for the appointment of a committee of the Board, by the Chair, qualified to select a list of books for the guidance of the State librarian in the purchase of agricultural literature for the State library. Also in calling attention to the State laws relating to free public libraries.

That your committee, not having sufficient knowledge of the severity and spread of tuberculosis throughout our State, and therefore not able to judge of the amount of money necessary to blot out the disease, are unable to recommend any approximate amount of money required; but that the part of the secretary's report relative to cleanliness and care of our herds, and a more perfect sanitary condition in and around farm buildings, be strictly adhered to, believing that by this the disease can largely be arrested by the owners themselves.

Respectfully submitted,
C. E. WHEELER,
L. O. STRAW,
J. J. FRYE, Committee.

This report accepted and adopted.

Legislative committee appointed by the Chair, as follows: B. F. Briggs, W. G. Hunton, E. E. Light.

Voted that the resolutions regarding seeds and cream, referred to the executive committee at the last annual meeting, be now put in the hands of the legislative committee.

THE LIFE AND WORK OF HON. S. L. GOODALE.

By Hon. E. R. French of Chesterville.

Mr. President, Members of the Board of Agriculture:

It is not a difficult task for us who still loiter around and are exploiting in the last years of the nineteenth century, to review the labor of those who laid the foundations of our agricultural improvement. The last fifty years suffice to cover the entire period in this State, though earlier efforts to awaken an interest in the cultivation of the soil antedate more than one hundred years. In 1787 the two brothers, Benjamin and Charles Vaughn of Hallowell were moved to form an association for mutual improvement, called the Kennebec Agricultural Society. They were country gentlemen at home, and essayed to inspire in the sturdy yoemanry around them the same interest and devotion to farm pursuits that animated them in the Old World as well as the new. Their success was meagre, however; they found but few kindred spirits to second their efforts, and the movement, after languishing for some twenty-five years, seemed to fail. The frequent allusions sneeringly made to "book-farming" but too plainly indicated in what esteem the well meant efforts of the Vaughns to elevate and improve the condition of the farming community were held. Nothing daunted, however, they attempted on a broader scale to awaken interest anew, and in 1818 the State Agricultural Society was formed. This movement, like the former, was destined not to succeed; it being found that owing to the difficulties of transportation, whatever it attempted to do was only a local good.

The center of all these early movements was "Kennebec," and the center of Kennebec was Winthrop. The same year the State Society was organized, a farmers' club, called the Winthrop Agricultural Society, was gotten up through the influence of the Messrs. Wood of this town, who also had been among the foremost to second the efforts of the Vaughns. Their efforts may be deemed to be the more effective from the fact that they were looked upon as to the "manor born," not being tinctured with the despised book farming. There are in almost every community men who are looked upon as leaders by common consent, to whose judgment the many defer.

Ten, twelve, fourteen years elapsed before any further organized effort, when, by selection of his fellow citizens of Winthrop, Maj. Elijah Wood "camped" upon the legislative session of 1832 and secured the passage of a statute establishing county agricultural societies. Quite a number were formed that year. The Kennebec Agricultural Society, being already organized, went to work immediately, and held its first show and fair that fall. Other counties soon followed her example. Thus our agricultural affairs continued through the first half of this century.

Meantime it was deemed essential by the leading men of the day that they have an organ of their own, and in 1833 the Kennebec Farmer was established, afterwards changed to the Maine Farmer, under which name it continues to the present time; one of the most reliable and influential journals of the agricultural press. This was a most opportune movement, as it allowed a most wise selection in its editorial management. Its editor, Dr. Ezekiel Holmes, was a man of scholarly tastes, and an investigating mind, supplemented by a liberal education, and to this work so congenial to him from every point of view he consecrated all the powers of his life and being. His pen and his voice were dedicated to the inspiration of the common people. He could instruct, he could arouse and plan, but he could not execute. This part of the work he was obliged to leave to the more practical men of affairs, and there were not wanting those who were ready to second his efforts, though long and weary years of labor and waiting intervened before anything like a realization of his desires and hopes was accomplished. But he labored on and on until his life went out in the establishment of the Agricultural College. He did not live to see its fair proportions, but like Moses from the top of Mount Hor, beheld the "promised land" from afar. His character was unique, his life unselfish, his labors well done, his memory revered. To his time, if not to ours, he was the apostle and high priest of our agriculture.

Thus far we observe that whatever has been accomplished is a local, not a general, good. The shows and fairs of the town and county societies, with all their enthusiasm, were a representation of what came about by accident, rather than of design, purpose, plan. No design, purpose, or plan that was primarily intended for the good of the whole had yet been devised and carried into successful operation. The way was being prepared, however; thinking was going on by the farmer's fireside, and prejudice against agricultural education was giving way to the desire to obtain it. The teaching of such men as Stockhart in agricultural chemistry, and Liebig in animal economy, were not lost on the community. The want began to be seen and felt by more than a few. Legislative action was invoked, and in 1852 a bill was passed creating a Board of Agriculture. Crude and imperfect though it was, constituting a self-supporting board, the opportunity was eagerly seized upon, and worked as an entering wedge that was to bring about something better. For three years the Board met in the then single room of the north basement of the Capitol. I remember its sessions well, for I made it a point to be present one or more days to listen to their deliberations, though acquainted with but few of the men who composed the Board. Dr. Holmes was secretary for these three years, and in a measure the guiding spirit. Such reports as he was able to prepare on a salary of one hundred dollars were issued; only the last of which—1855—rose to the dignity of a public educator. The Board won for itself, however, the recognition of the State, and was acknowledged to be one of the agencies that had to do with its future prosperity. In 1856, conditions were favorable for further legislative action, and a bill was passed reorganizing the Board on a broader basis and more comprehensive plan, and granting to it State support. From this time its success was assured, and its influence destined to be largely and widely felt. As a State we were to be no longer behind our New England sisters, but abreast of any of them. Our great agricultural uplift dates from this period.

The Board of Agriculture which met January, 1856, and was largely instrumental in bringing about this new legislation, and which was to feel the influence of the new life it would infuse into it, making it essentially a new Board, elected Stephen L. Goodale it first secretary. Composed and unobtrusive in demeanor, retiring and reticent in his intercourse, few, save those who knew him, were aware of the forces at his command. He entered upon the discharge of his duties with a zest born of good will to men, and love of State.

In a circular of thirty inquiries he outlined the facts he wished to know, and indicated the sources from which he expected to obtain the desired information. Men saw at once that no ordinary man was the representative of the Board, and their confidence in its usefulness was inspired from the fact that all who had aught to disclose were taken into its councils. If the first of his annual reports was a surprise, what was to follow became a revelation. Every good citizen's pride of State and appreciation of its advantages was greatly increased. Their homes, their farms, their shops, had been invaded by one who wished to make their hard earned facts his own. Though there might not be among them much of the knowledge that is obtained from books, there were many who had stored up much that comes from observation and experience. The world's school is always open, and men and women are continually passing through its portals. It was a surprise to them that one with the semblance of knowledge should come to them to learn; it was an inspiration to them that they had something to impart that was worth knowing.

Mr. Goodale obtained what he most desired to have,—a knowledge of the present condition of the State's greatest industry, its adaptability for one or more forms of that industry, and its present and future capabilities. Thus provided, he laid his plans, and mapped out the work he expected his coadjutors, the members of the Board of Agriculture, to do.

The Maine Board of Agriculture has always been a composite body of men. Some were scholars because of opportunity and privilege, some from the force of circumstances and necessity. He of the lore of books imparted to his brother somewhat that the ages had gathered up; he of the school of nature, of the things man only learns by contact and observation. As the result of bringing together these diverse powers and abilities, the deliberations of the Board became of much interest to those who engaged in them, and through the reports it annually sent out, a wide spread interest was awakened all over the State. Nor was this interest confined to our State alone; its popularity went abroad. Men foremost in agricultural pursuits, like Dr. Loring of Salem, Mass., afterwards United States commissioner of agriculture, attended its sessions, and profited by its discussions. Not a few of our own grave legislators condescended to descend to that lower arena where were displayed abilities equal to their own.

Mr. Goodale entered into this new work with all the ardor of his being. Unconsciously to himself, but not to others, he was the master spirit. Deigning to be taught by the humblest, he was not abashed in the presence of the greatest. Whoever came in contact with him felt the presence of a superior intelligence, and was willing to accord to him a worthy place. He had not that external enthusiasm, not the exact scientific fact at his command that made Dr. Holmes so interesting as a speaker and a teacher, but he had what Dr. Holmes had not, power to apply in a practical direction whatever of knowledge or of fact could be obtained. More than this, he had a facility of expression, a plainness of speech, that enabled him to present such knowledge or facts to the understanding of others in such a way that they could apply it themselves. They were thus familiarized with things that otherwise would have seemed too high for them, for they had learned them of one who in all respects appeared as a man speaking to men. In the deliberations and discussions of the Board, he was a man of few words, often expressing his approval or dissent of the labored deductions of a member in two or three terse sentences that went to the root of the matter; yet he could be voluminous, exhaustive even, if the subject in hand required it. He planned for continuity of work by the Board, and this he succeeded in accomplishing through the change to a "hold over" membership of three years, and during his incumbency of the office of secretary—eighteen years—the range of topics taken up and discussed touched almost every phase of farm life and the industrial facilities of the State. The composition and arrangement of the Board at that time was well calculated for this. Dr. Loring, before referred to, in one of his visits commented upon this feature of our organization, by way of comparison with theirs in Massachusetts, which he characterized as a frame work with a secretary as figure head, and very highly complimented the secretary and his Board for what they were doing.

Nor were his efforts for improvement and upbuilding confined to present conditions. With a clear insight of the present he combined a broad outlook for the future, and repeatedly called the attention of the farmers to the advantages that would accrue to them from orcharding and dairying, two pursuits that are now so dominant in the State.

Naturally he was an original investigator, and in following out this inclination spent many days in the rustic laboratory in his green house in explaining some not well defined fact, or solving a new one. The result of these labors is still apparent among us; his active mind in old age is still at work. He has labored not so much to tell men what might be, as to show them how it could be. With him to accomplish a thing was a matter of fact, and he set himself about what ought to be done. In this he succeeded in a remarkable degree so far as the cause of agriculture in this State is concerned; and you can do no better than to perpetuate a remembrance of him and his labors by placing his portrait in this room.

But why continue more? My theme enlarges as I recall. These men have lived and labored, and we have entered into their labors. From the vantage ground of a larger vision they looked out upon the world to behold its needs, and came to its relief. This was no less their privilege than their duty. They would have been false to themselves, false to their generation, false to humanity, if they had not done it. Man in all ages has been helped and benefited by just such lives, and will be in the ages to come. They are not your men of wealth; wealth does not dominate the world. Ideas rule in the realm of matter as well as of mind, and men rise up to do reverence to those whose lives are fraught with blessings for themselves and others. Job reasoned of immortality from the perpetuation of life around him; Plato reasoned of it from a standpoint within himself, and sought to graft his theory on the Athenian philosophy; but such as these find it in human ministries, upon all of which God sets the seal of the Divine.

Gentlemen of the Board of Agriculture: All of you are conversant with the events of the last half of this century, have looked upon the ever changing panorama of life that has moved on before you; some of you have had glimpses of the first, and heard the pioneers' tales. Which picture enchants you most, this or that? I have looked upon five generations of men, my place is the third. I knew a majority of the settlers of the region round about me, who broke the stillness of the primeval forest with the axe and gun, more than one hundred years ago. I have seen them in their primitive homes and in their more pretentious mansions of later years. I was born in one of the former, and live in one of the latter. In my childhood I heard oftentimes the story of pioneer life; of going to the neighbors by spotted trees, and ten and twenty miles to mill with a hand sled. I have heard my grandfather say he had hauled many a bushel of corn to Hallowell with oxen, a three days' trip, and sold it for two shillings a bushel; while he paid sixty dollars for his brass clock. All this they did, and still they lived and throve, and were happy. More, they gained a competence of this world's goods. I remember for myself when to move merchandise from the Kennebec to Farmington cost a three days' trip; and to the upper towns of the county it took an entire week. To get a letter to Washington and back required three or four weeks and cost twenty-five cents each way. There were no steamboats, much less railroads, for public transportation. The rattling of the teakettle cover had hardly attracted Watt's inventive genius, and Fulton was a mere boy. Stephenson was content to use horse power on his tram roads. Franklin had indeed coaxed the lightning from the clouds with a tow string and kite, but no one had tamed the electric steeds.

To-day, how changed! The power of steam is sending mighty leviathans, floating palaces, plowing through the main, defying wind or wave. It harnesses the snorting iron horse for a trip across the continent without stopping to breathe. There is hardly a valley but that the low lying smoke, curling in the crisp air of the morning, shows where a railroad train is creeping along. But already steam is doomed. The thunderbolt is hitched to your car and you speed along with a whining sound as of Eolus escaping from his cave of the winds; and when the day declines, and night settles down on the earth, you hang aloft a lamp that puts out the moon. To-night you will know what has happened to-day the world over and the Storm King will be scented from afar. You cannot wait for the swift post, but call to your friend through the air, and he answers you. All this we look upon to-day, and are watching and waiting for more. Which picture, I ask you again, pleases you most, the past or the present? And yet there are those who say "The old days were better than these; man was truer and happier then than now, or ever will be." Turn from this longing and repining for the leeks and onions of Egypt, and ask whence come these achievements of the century we know most of? Whence all its glory and its good? Your Napoleons and Nelsons never achieved it by victories on land or sea; your Vanderbilts and Rothschilds never brought it; its price is too great for them; wise statesmen and grave judges never secured it by laws ever so beneficent; its seat of power is higher than honor or ermine. It comes out of the labor and the sweat and the thought of the toiling millions; it is the achievement of useful lives.

Among the wonderful changes we have noted as occurring during the last half of this century what part of them have come to our own State, and especially to the agricultural communities whom we represent? Take a survey of it for your answer. Go to the homes of our people and see the greater comforts that abound; the amount of toil that is lessened; the neater and better dwellings, with their pleasant surroundings; the larger and better barns that house our stock with less shivering in the stalls; the improved farm implements lying around that enable two or three men to do the work of five. It is true that fewer numbers gather around the frugal board, that there is heard less hum of children's voices in the "red schoolhouse," nevertheless greater intelligence and more earnest thought is indicated by the books and papers scattered about the farmer's sitting room, and as for the absent sons and daughters, you will find them in the homes and business that span a continent. Some of them return ere long to rebuild or readorn the old homestead. Here and there may be an "abandoned farm" but it is an evidence of good sense rather than a lost cause. Industries are multiplying on every hand that create that best of all consumers, a home market. Every year our State is becoming more and more a sanitarium for the tired and exhausted denizens of the cities, who seek for rest and recuperation in our quiet retreats, or by health giving streams. The votaries of pleasure and of the chase find here their Mecca as they skirt along our shores or plunge into the depths of our woods.

But what has this man whose labors we recall to-day more to do with the changed conditions that surround us, that compare so favorably with those of our fathers fifty or a hundred years ago, than has the average man? Simply that looking out upon the affairs of the world from a higher standpoint than does the average man, he has sought to widen his vision, and enlarge his perceptions until he shall comprehend his opportunity and duty alike. In a word, he has been to others what he is to himself, an inspiration and a life. Therefore among the men of our times and our State worthy to be thus honored for their benefactions, enroll the name of Stephen Lincoln Goodale.

He was born in South Berwick, Maine, August 14, 1815. His father removed to Saco the year following his son's birth, where he followed the trade of book-binder, adding to this the sale of books, and, as was the custom then, of medicines. From his earliest youth Mr. Goodale was surrounded by books and chemicals, and was brought into contact with many physicians and teachers who frequented his father's shop. His taste for investigation was stimulated by the preceptor of Thornton Academy, in which he afterwards received a sound preparatory education. Instead of proceeding to college, as did most of his classmates, he returned to assist in the business of his father, until his relinquishment to the son, in 1837, making himself acquainted with all the details and entering with zeal into special chemical studies connected with pharmacy and agriculture.

Inheriting rural tastes, needing open air exercise, and desiring more land than a town garden spot, he bought, in 1841, the place where he has since lived. Here during more than fifty years were carried on experiments in the application of science to plant life, not only in agriculture, but forestry, fruit and flower culture, and artificial fertilizers.

In 1856 he became secretary of the Board of Agriculture, and continued his service by unanimous re-elections until 1873. He has given special attention to the subject of artificial fertilizers adapted to the needs of the farmers of Maine, and he has been fortunate in extending the range of utility of certain phosphates hitherto thought to be of little importance.

The vigor of his intellect and his persistence in study are well shown by his acquisition of the German language at the age of sixty-five.

During ten years he served as trustee, and ten more as vice president, and for more than twenty years as president, of the Saco & Biddeford Savings Institution. In his eighty-second year his alertness of mind is not impaired. He takes constantly a deep interest in all scientific and social questions.

Library committee appointed by the Chair, Prof. Chas. D. Woods, C. E. Wheeler, W. G. Hunton.

Voted that the thanks of the Board be tendered to Hon. E. R. French for his fine address.

Five-minute talks by members.

ANDROSCOGGIN COUNTY.

B. F. Briggs—One year ago to-day, as the Board was planning its work for the year 1896, I made the remark that I thought there was one industry in the State that had not received the attention of the Board that its importance deserved. I referred to that of raising and caring for live stock. I still think there is great need in this direction. I believe that if our farmers understood better how to care for their stock, there would be less of contagious disease, less tuberculosis. I believe that their barns are not, as a rule, properly made, there is not sufficient sunlight. They are liable to be dark and ill ventilated, and I think an improvement should be made, and the Board ought to work in that direction to a greater extent. There is one other thing in regard to the care of stock that I think is entirely wrong, and that is keeping the stock in doors all winter. I know that in our section there are many farmers who tie their cattle in barns that are dark and ill ventilated, and allow them to stand there from fall until spring without once going to the open air. I believe this is wrong, entirely wrong. What would we think of parents that would keep their children in doors all winter without giving them any exercise, in poorly ventilated houses? I believe that there is work that ought to be done by this Board in that direction, and that is the only idea that I am going to express at the present time.

KENNEBEC COUNTY.

W. G. Hunton—Mr. Chairman: I would like to leave out, perhaps, some of the needs of my own county, and use my five minutes in finding fault, for the reason that I think that sometimes by finding fault with our own work we lead others to suggest something that will do us good. It does more good than if we admired what we had done.

In my experience of the last year I think I have been in seven different counties of the State, and in all seven of those counties I have found one trouble with our institute work, for which we have quite a liberal appropriation, and which, in a measure, is our work to do. And it is this matter of institute work which I wish to speak on, and in regard to which I wish to call out opinions from other members of the Board. While we all recognize that the institute work for the last few years has been a great improvement over the past, isn't it possible for us to suggest ways by which we can still improve it? We find that in holding these institutes as a general thing it is the disposition of the members, and of us all, to hold them at central places, at places where there are large granges and prominent farmers who are interested in the work. The result is that we have well attended meetings, interesting meetings, but are those meetings productive of the most possible good? I think not, for this reason,—that invariably we reach a class of farmers who do not need them, who are awake to the importance of their labors, who are awake to what their labors need to produce for them. In fact I have blushed very many times for the last year when I have attempted to speak to those representative farmers, because I realized that they were better able to say things of interest and profit to me than I was to them.

I believe that, scattered all through the State of Maine, there is a very large class of farmers to whom we owe a duty and to whom much good can be done, that we do not reach by holding our institutes in these central places. There is a class of farmers throughout the State of Maine that need waking up, that need to have it impressed upon them that they are not applying to their business their best efforts.

Now, if it is possible for us to so arrange our institutes, to so divide the work, that we can get at that class of farmers, to whom I have briefly referred, I believe we shall be extending this institute work in the direction in which it needs to be extended. I have the idea that in holding institutes in a certain county it might be possible for us, instead of holding all day meetings at some central place, to hold one session meetings in school districts. Suppose we do not meet but half a dozen or a dozen farmers; they will not come to us, and if we reach them we must go where they are. There are lots of farmers who do not understand what an institute is. They think they will only hear scientific principles discussed,—book farming. They do not understand that they will there meet practical men who are actually depending upon the soil for their daily living. But if we go near their homes, into the school districts, we shall gradually get them to come to the institutes and be interested in the work. And those men who come once and get interested will seek us the next time, whether we are in their school districts or in their shire towns. This is the point in our next year's work which interests me more than any other, and which I hope other members of the Board will discuss, whether they believe as I do or not; because this is the only opportunity in which the Board as a Board have an opportunity of exchanging ideas, for the year. If we do not use these few moments that are alloted to us, in exchanging ideas, we neglect the opportunity of getting the most out of each other in regard to our work.

LINCOLN COUNTY.

J. M. Winslow—I do not know as I have thought of anything in particular that I wish to say about the institute work for the coming year, but I can endorse what I have already heard. I have thought much of the idea that Brother Hunton has advanced, of holding evening meetings, perhaps, in school-houses, with but one speaker. The expense would not be large, and by holding evening sessions only, going into a community and getting the farmers out, and getting up a discussion and getting them to talk, you can use them to help one another. In every community there are some men that are better farmers than others, and if we can draw out ideas from these, and get them to exchange ideas, which they would not do otherwise, I think it will be a good plan. We can hold more of these meetings, perhaps spending a whole week in going into different places, one evening in one school district and another evening in another.

The idea of Brother Briggs in regard to live stock is another point that I can endorse. One of the most important things is the raising and care of live stock, for that encourages other branches of agriculture. When we undertake to raise and care properly for live stock we have to raise something to feed that stock, and consequently the two go together, and one encourages the other. And it is the one thing that we get any revenue from, although that is small, and almost all from our dairy stock.

CUMBERLAND COUNTY.

JOHN J. FRYE—I came more to learn than to be heard from, as I am a new member. I have listened with a great deal of interest, and I fully endorse the remarks that have been made here as to institutes. I think there is a great deal of force in the remarks in regard to the large places. Those people are generally well informed, and it seems to me that we want to reach the farmer farther back, who does not have the advantage of these means of obtaining information, that we may do him good. I believe that all the way along this is a way of education. We are just beginning, as it were, in the lines of education, and I fully appreciate the standpoint of the farmer to-day. We have something before us to live for, we are not merely farmers, and poor at that; but the farmer, in my estimation, is the first man that should be respected and helped, for he tills the soil, and from that comes our bread and butter, and to him we look. My thought for us all is that we should look up and not down, that we should look out and not in, and make progress.

OXFORD COUNTY.

JOHN F. TALBOT—Mr. President, Members of the Board: This is my first attempt to say anything about the needs of Oxford county. Oxford county is a large place, and its interests are varied. The northern part is a lumbering district, and the men who are engaged in farming do it more as a recreation for the summer months, preparatory for their winter work. Institutes held in a good many of those northern towns would not create the interest that they would in many of the central and southern parts of the county. The dairy interest in some sections is very good, there are quite large dairymen. And corn raising for canning purposes is carried on to quite an extent. A great deal of the county is very nicely adapted to that purpose. My thought would be to reach these back places that the Brother speaks of by tracts that we might send. You know all religious societies depend a good deal upon their tracts, and the secretary issues what we might call a tract, a bulletin, and I think that through that means a great deal of good could be done to these places where it is almost impossible to go and sustain institutes. It would be my idea for us to get just the best writers possible from among these farmers who have been spoken of, and who conduct these institutes, and get them to write their ideas on practical things, and see if we cannot wake up an interest by sending these printed bulletins to those men who have ability enough and education enough, only there is a faculty in them lying dormant. It seems to me that in this way we could do a great deal of good. I am much pleased with this, my first meeting, and hope to be with you again.

YORK COUNTY.

L. O. STRAW—Mr. President, Glentlemen of the Board: York county to-day is about as it has been for the last two years of my Board experience, and the suggestions that I might make to-day would probably be about the same as those that I have made in the last two years. We have held our institutes, and we have endeavored to hold them in certain localities where the people were needy. It has been quite a study with me for the last year, what to recommend in relation to the interests in York county. We seem to tend, in the main, to dairying and orcharding, especially dairying, and that to a greater extent in the lower part of the county. In the upper part of the county they are not so largely interested in dairying as they are in a mixed husbandry like stock raising. We farmers, I think, are beginning to feel that dairying is the leading industry, and more ready money is realized fromthat than from any other interest. We are at a distance from the market but I do not knowbut that,under the present condition of things, we are about as well off as we would be did we live nearer the markets. We have but little difficulty in selling our goods. We find plenty of men who are ready to come to our doors and buy. They are ready to buy our apples, our cream, and the various products that we raise, so that the farmer in general has but little occasion to market his goods. Now and then we see a farmer passing down to the market, but he has a light load, not such loads as used to be hauled. The trend of business seems to be in another direction.

I am thoroughly in sympathy with what has been said in relation to a change in institute work. I am inclined to believe, from my experience, that it is better to scatter our institute work than to concentrate it. I think that we should accomplish more by holding a meeing in this village—this house, or schoolhouse it may be—this evening, and in another place, if not too far distant, the next evening. The idea strikes me as very feasible and a very good one. I am rather inclined to believe, if we are privileged to hold any institutes in York county this year, that I shall recommend that we lessen our force and cover more ground, thinking that we can get better results from working in this way than we can by holding our institutes in the larger towns or the cities. We held an institute in Saco last year, and it was a very profitable institute, but the question arose in my mind whether we would not have done more good had we held an institute father back. I am thoroughly in sympathy with this idea of giving the people back in the country the advantage of these institutes if possible. They are absolutely at a disadvantage, as everybody knows, and if the Board can bring about anything that will be of benefit to them, I believe that we should do it. I have been forced to believe that our institutes held in the larger towns or the cities reach only a certain class of men surrounding those places, and these very men are established in their work. They have a settled business, and whatever might be said or done would not affect them materially in their work. If they have large dairies, and are milkmen, that is their business, and they know how to feed and how to produce the most milk. But the man who lives farther back may be susceptible to good advice in that direction, and it will do more good to him than to those who live nearer the towns.

SOMERSET COUNTY.

S. H. Goodwin—Mr. President: I do not think that it would be quite the thing for me, as a new member, to go very much into the methods of the apportionment of the money, but the thought does strike me that we might perhaps supplement the work of the institutes, as they have been conducted for a series of years, by educational work along the line suggested by the member from Kennebec. We had in our county this year one institute and one dairy conference. I am of the opinion that the dairy conference was productive of great good, and that the benefit received was fully equal to the cost of the meeting. That was used as one of the institutes. We want at least two institutes, I think, in each county; certainly if the county is as large as Somerset, and the interests as varied. It would seem to me that if a large portion of the money which was laid out was distributed in the manner suggested by the member from Kennebec county we would not be working in the direction that would accomplish the greatest good for the greatest number; but I think a supplementary work might be carried on, taking a portion of the appropriation and using it in that way.

The dairy interest predominates in our county, and yet I believe there is another interest on which I ought to speak, which has not been mentioned here. I mean the sheep industry. Formerly our county was the banner county, I think, in that industry, and you all know the condition of the industry at the present time. I shall not attempt to go into the causes which have led up to the great depression, but I presume my worthy predecessor would agree with me that the interests of our county, and I believe I may say the interests of Maine, demand that we take hold of that line of institute work from an educational point of view. Very few of our farmers are raising sheep at the present time, while leading sheep breeders in other states are fairly successful. And there is a large portion of the territory which is not so well adapted to any industry as it is to sheep raising, that I think in the near future might be better appropriated for that purpose.

But whatever line of institute work we engage in, and whoever the speakers are, or wherever they may go, I think we should try to impress upon them this fact,—that they should endeavor as far as possible to urge the farmers to live up to the teachings which they have had, to their own knowledge. Our farmers, I believe, many times are better educated than we give them credit for, but are not living up to the facts as they know them. We ought to stimulate them, if possible, to try to have the courage of their convictions.

SAGADAHOC COUNTY.

T. E. Skolfield—Mr. President, Gentlemen: I do not know that I have very much to say, more than I said last year. Sagadahoc is rather a small county, but it has varied interests, and the largest business it has is ship building. In the southern portion a considerable number of the people are engaged in fishing, but the northern part is a very good farming section, and they can raise nearly all kinds of vegetables, grains, and hay, that can be raised anywhere. And the people are very enterprising in the towns of Richmond, Bowdoinham and Topsham. But when you come to institutes, we have held them in the large places and we have held them in the small places, and we cannot seem to get up much of an interest. We have had a State Dairy Conference there, but that did not seem to create a great deal of interest. For my part, I do not know of anything better than sending the bulletins to the different farmers. I think that would have about as much influence as anything. We held a meeting in connection with the grange in Topsham, which is a large grange, but we got out only a very small crowd in the day time, and hardly anybody in the evening. What has been said about holding the institutes around in small places might do in some sections. I think that some lines of work, which I do not know as I could suggest, which would create an interest among the farmers to attend these meetings, would be of great benefit.

FRANKLIN COUNTY.

C. E. Wheeler—Mr. President: I do not know as I can add much to what I said last year. I represent a county which has many and varied interests, in agricultural matters. In the southern part of the county the people are interested more particularly in fruit growing and dairying. In the eastern part they catch the enthusiasm from their friends in Somerset county, and have been in the past, and are to-day, interested in sheep raising. In the northern part it is altogether different. They depend almost wholly upon their labor in the winter and the raising of stock, although there is one creamery located at Phillips. In the western part of the county, taking the towns of Carthage, Wilton, and perhaps a part of Jay, the chief industries are orcharding and stock growing. I think that if we were going to hold institutes in our county they should be along all these lines of work, to make them particularly interesting.

This brings me, perhaps, to a little matter of which I have thought a great deal. We, to-day, are doing all we can to teach the farmers of the State to produce butter at a less cost. We say it can be produced for twelve cents a pound, and we have been hammering away at that business for a good many years. At almost every institute the subject has been, a more economical way of producing butter. I think that if some of the labor, some of the talk, and some of the expense, had been put into trying to teach the farmers of the State, especially in some portions of my county, how to produce wool more economically, or in the production of beef, it might have been an advantage to some. If we can produce butter at ten and twelve cents a pound, and make a living, why cannot wool be produced at lower figures than twenty-five cents? If we could get twenty-five or thirty cents for wool we would soon be ready to drop dairying and go into sheep raising. And in the eastern section of our county there are a great many farmers who would abandon dairying in a moment if they could see any chance of getting a new dollar for an old dollar out of raising steers. Cannot more work be done to help those farmers who are so desirous of raising choice steers? Cannot we produce choice steers at a less cost if butter can be produced at a less cost? We have held in our county but one institute this year, wholly on account of local matters. Other institutes were planned, but could not be held. Although we held, as you may know, a field day, or orchard meeting, at Chesterville, in the orchard of Phineas Whittier. And I want to say to you now that it was a grand good meeting. If there is a chance in any county to hold a field day in the way that we held one there, whether it be for the advancement of orcharding, dairying, or the poultry industry, do not fail to hold it.

KNOX COUNTY.

E. E. Light—Mr. President, Gentlemen of the Board: I feel somewhat as the member from Kennebec county, that we should reach out into the back lots and cross roads. And I am only going to suggest one subject that we should use. There are plenty of other subjects, but I will only mention this one. We have become quite a large dairying State, and with the lowering tendency of products we must do all we can to sustain the quality of those products. And I believe that we need to go out to the man that produces milk and give him the latest scientific information, so far as is practicable, in regard to the different influences that affect the quality of that milk and its products. We get information of this kind in our dairy conferences, but I have not been aware of its being extended into our institute work as much as I think the importance of it demands; and I make the suggestion that we try to reach the common farmer that produces milk, in order that he may have a better knowledge of how to treat that milk and its products in order to sustain the reputation and keep up the prices of those products.

PENOBSCOT COUNTY.

GEO. N. HOLLAND—Mr. President, Members of the Board: I believe I have no other suggestion to make in regard to the line of work which we should pursue in our institute work in Penobscot county than I presented last year. I mentioned then the reasons why I thought that dairying should be encouraged in our county, and I should add one other industry the present year,—that of sheep husbandry. I think that we might, perhaps, introduce those things into our institute work the coming season with profit.

PISCATAQUIS COUNTY.

W. H. SNOW—Mr. President, Gentlemen: I have listened with very much interest to the remarks that have been made. I studied considerably on what would be for the best interests of my county, in contemplating some institutes this fall. I went around to those places from which I had received an invitation to hold an institute, and spent some time in talking with the people, and they said, "Give us some good, practical speakers on subjects that we are most interested in." One institute was held in a town where only one had been held before, and I did not expect a very large attendance, the way they are situated. But when I got there I was greatly surprised to find so many, and some had come fifteen miles, and it was a cold, rough morning. That encouraged me a good deal. The people were interested, and we had a very profitable meeting.

I do not know as I can suggest anything, except that each member should look over his county. We have various industries in our county. The central and eastern portions are interested considerably in the dairy business. It would be my intention, when it comes my turn again, to hold some institutes in some of those towns that are a little outside. I like the suggestions of the member from Kennebec county, and I think they will be followed out. Several years ago we got up some Farmers' Clubs, as we called them. They met once a month through the fall and winter in the surrounding towns, and a great deal of good resulted from them. I have thought that perhaps we might conduct our institutes after that same manner. If we had one good, smart speaker, and could get the farmers to participate in them, they would do a great deal of good. I think I shall try that in my county for the ensuing year.

AROOSTOOK COUNTY.

J. W. DUDLEY—Aroostook is, as Brother McKeen says, the garden of Maine. He did not say that for the last three years the garden sauce had not paid very well up in that county. It is quite a large place, away up *through* the woods, if not *in* the woods. Going up on this new railroad you might think that it was in the woods, but when you get up there you find a place 140 miles long and nearly 50 miles wide. Our towns are quite widely scattered, and since I have been a member of the Board it has been my intention to scatter our institutes, holding them at different points from one year to another, taking the places where they have never had any institutes, or not for a number of years. And my plan is for the remaining year that we spread out still more, taking up towns that have never had any institute work done in them. I am well aware that the work that has been done this last year, especially in our county, has been of great value. You all know that our county went almost crazy on the potato question. Well, in going crazy over that, of course we had to have lots of fertilizer, and when you have to buy from five to eight hundred dollars worth of fertilizer, you do not raise potatoes enough to pay the bills, and it puts a man in a hard place. We feel that something ought to be done. Any man feels that way when he has got into a hard place and don't know how to get out. And so we have been discussing the different methods of bettering the position of the farmers in that county, and I would say that this year we have had efficient work done. We have talked up the stock raising and the dairy business, and I think in the future there is going to be a change. Of course we cannot expect any radical change very soon, but the average farmers throughout the county, our best men, see that there must be a change for the better; and so in different sections they have interested themselves in stock raising, and in some sections they will go back into sheep husbandry. I think the method that the gentleman from Kennebec county spoke of is a good one; I am in favor of any method by which we can get instruction before the farmers that will be of benefit to them. It is a matter of how many we can reach. I think a great deal can be done by the members of the Board in each county, by distributing the reports of the Board of Agriculture. I would say that I have had a great call for the reports. The men to whom I gave reports one or two years ago will ask for new reports, even before they are printed. There is a growing interest in them. I am a tax collector, and when I start off collecting taxes I take a bundle of reports, and when I come across a man who wants one I give it to him, and it does him good. I think that this report of the Board of Agriculture, if it is properly distributed throughout the State, will be a great help in educating our people, and then when an institute is held we shall be sure of a good audience.

MR. HOLLAND—I want to thank our secretary for the work which he has done so nobly in our county. A few years ago it was almost impossible to find a place where we could have an institute, and we used to beg for an opportunity to hold one. Now we have letters from all parts of the county asking us to have institutes in their localities. I think it is encouraging to know that the people want the secretary to hold these meetings, and I would like to say that we have tried to have the institutes in such parts of the county as have been neglected somewhat. We have had large and attentive audiences, and we believe much good has been done.

MR. WHEELER—I notice in our company three or four ex-members of the Board, and it may be that they can throw out some suggestions on institute work for the year to come. I would like to hear from Mr. R. W. Ellis.

MR. ELLIS—Mr. Chairman: I have been very much interested in the ideas thrown out by the members of the Board. I have had some little experience in institute work, and while I believe that institutes could be held in places that have not had them, yet I believe, on the other hand, that an institute should not be put where the people do not want it. I have attended a number of institutes in localities where they had no particular desire for an institute, and there would be a very meagre turn-out. In a great many instances it is worse than holding no institute to hold one that is very meagrely attended, and but little interest shown. The speaker feels no interest and no one else has any. I believe in holding institutes in localities where the people want them, as I believe they do more good. You may thrust an institute into a neighborhood where there is no desire for it, and you will not get much of an audience. You must work, to a great extent, through those who are interested. You have got to stimulate all classes, and if one man is stimulated to better works on his farm, his neighbor sees his good works and in time he will imitate him. We cannot have everything just as we would like it. I would like to have an institute held in every locality where they have not had one, and think the people should have interest enough to attend, but I have not found that to be the case. In my experience you must get the men out in order to do them good, and I think in the majority of cases you get more men out in a locality where an institute is wanted.

HON. E. R. FRENCH—I do not know what I can say that will meet with your approval in this matter. In my earlier experience it was different. Our Board had fortnightly sessions, as you will recollect, and the work was almost all done there. As early as 1865-6 we were discussing the propriety of going out and having some annual sessions in different parts of the State, but when the law was changed it changed to the institute form. A good many of the people do not know what this means, some of them do not want to know. The reform has not reached all sections, the old prejudice exists in some places. As has been suggested, it is better to find those who are interested, and go to them. Interest in reformatory measures, among mankind, spreads, you cannot plant it exactly. It must go out from some center of influence, and so it seems to me that the work should be planned accordingly. This is my idea, and I have thought (pardon the criticism) that not very much was gained by importing speakers, for they talk to us from a different standpoint from our own. Some of them are very excellent. I am always interested to hear Governor Hoard, but even Governor Hoard does not know what are the conditions of Maine agriculture, at least, I judge not from criticisms he made a year ago; and I am going to suggest that the next time he comes into this State, instead of riding up on our railroads which go through the swamps, he get off and walk, and take to the uplands where the farms are. And John Gould the same. I think they would know more about the farming of Maine than they do now, and would have more to suggest, for appearances sometimes are deceitful. Their criticisms of our barns, the manner in which we raised our stock, etc., seemed to me decidedly out of place, for I have seen some most unpromising looking barns that when I went inside were really too warm. Some of our farmers have been told this story so much, as to how they ought to keep the stock, that they are destroying their stock. Here is the seat of your tuberculosis, the overheated stables and pampered stock. We are carrying artificial means too far, getting beyond nature so far that she is not able to support us, and so disease is pregnant. It is just so in human society, the same great law of the universe governs in all these things. You cannot pen yourselves up in this room, 100 of you, and sit here all the time and be healthy, in the overheated, foul atmosphere that will soon be generated. I went into a stable a year ago where the poor fellow had gone so far that he had sheathed it up all around, and just as soon as I stepped into that warm, fetid air I saw that it was impregnated with steam. In what condition was his stock to leave that atmosphere and go out into the cold? I want a good warm barn but I want it dry. I do not want frost to gather in my tie-ups. These are the things that we must learn, and the things that we must show to each other. If we have found them out we must be telling each other, and showing the reasonableness of such things. This is what belongs to institute work, and you cannot get too many interested in it. Go out with such ideas and press them home, and if people come to see you be sure that they find that you are putting them in practice where you live.

DR. A. W. HARRIS—I am not sure that I have any important suggestions to make. For some reason I remember one institute in which I gave nearly all of the suggestions. Shortly after I came to Maine I went down to Vassalboro to an institute. I was to speak in the morning, and Mr. McKeen and

Major Alvord the rest of the day. I did all the talking in the morning, and there came a terrible snow storm so that in the afternoon Mr. McKeen and Major Alvord failed to put in an appearance, and, as there was nobody else, I talked again all the afternoon. In the evening we waited anxiously for the secretary and the distinguished specialist to appear; and finally the time for the meeting arrived and passed, and the president came to me and told me that I would have to talk again. I was green in the State and supposed I would have to do as I was told. I was pretty nearly talked out, but fortunately very soon Mr. McKeen and Major Alvord came in, and no man was ever more thankful to see the end of his performance. Major Alvord gave what seemed to me to be almost a model institute talk, about milk, and the composition of milk. First of all, it was very clear. His points were made accurately, and he had thought them out carefully. If I were to make a criticism on a good deal of the institute work I would say that it lacks because it is not prepared. We ought to have something in particular to say,—and right there I think we could spare a few of the jokes. Almost every man seems to think that when he goes before farmers he must interline what he says with a lot of jokes. I do not believe there is any more need of talking to farmers as if they were children, than as if they were ministers. I believe thoroughly in laughing as you go through life, but be sure that behind the laugh there is something that is not simply laugh,—that is business.

We ought to be prepared carefully, so that we shall not wander aimlessly over the whole field, but will get some definite statements before the people, and then let us put these so that they will understand them. A young teacher came to me once and said to me, "These Maine boys seem to me to be the most stupid boys that I ever came across. I have been doing my best to teach them, and sometimes it seems to me that they get absolutely nothing." I said to the young man, "The trouble is not with these Maine boys, the trouble is with you. You put yourself up as a standard and think that these boys will understand off-hand what you understand. Try to remember what a very little you knew when you were a freshman." I think it is very important for us to remember, when we come before any audience, that details ought to be left out. A few general statements, well illustrated, are likely to contain all the truth that your audience will take in, and something understood is a great deal better than a lot of things not understood. I found this true when I was in Washington, as director of the office of experiment stations. I was the executive officer, and simply followed the results. I found that ordinarily I could go out and talk about the scientific work more interestingly than those who were engaged in it. I knew simply enough to grasp the main facts, and I was ignorant of enough details to leave out those details and place before men some few things that they could grasp and carry away. What I have to say in regard to institutes is to get ready for them. Do not impose upon your audience by pouring out the talk that happens to come into your mouth, but get something out of your heads when you talk, and put it in shape. And in the third place, do not say too much. Say it clearly, concisely and accurately, and stop when you are through.

PROF. CHAS. D. WOODS—Mr. President: I have talked so much since we have been in session here that it seems almost absurd for me to say anything more. Along this line of institute work there are certain important things to be done. I am quite certain that I agree more nearly with what Mr. Ellis said than with other members, as to the places in which institutes should be held, unless I misunderstood the other men. I do not think that the heart of a city is the place in which to hold a farmers' institute, but I do not think that we want to go out into the parts of the counties that are unsettled and hold our institutes there. We want to go where the men are, and we want to get together the men whom we want to hear us. So far as my experience has gone in the advance of agriculture throughout a state, and I have to think of Connecticut instead of Maine because I am so much more familiar with it, it has been done by men here and there over the state getting interested and commencing to put into practice the things that scientific men have brought to their attention, and their neighbors getting ideas from them. The great mass of the farmers of our country are not going to get book farming, scientific farming, the principles which underlie agriculture, from first sources. They will get it from some of the more progressive and intelligent men of the community getting the ideas first and putting them into practice; then from the experience of these they will see the need of trying to improve their conditions.

I am a little surprised at the things that have been mentioned, or the things that have not been mentioned, as the needs of institute work. We have been talking about the manner of producing until that seems to have engrossed our attention. It seems to me that one of the great lacks of farmers in this State and in all states, so far as I have seen, is business principles. And I would that every farmer in our State could get the impression into his heart and his mind that he is a business man, and that if he is going to conduct a successful business he must do it along the same principles which underlie business anywhere. Farming is, in a sense, manufacturing, and just as far as a man makes a finished product upon his farm, in just so far will he be successful. We must study the principles which underlie economic production. We not only have got to learn how to produce certain things but we have got to learn how to produce them the cheapest. I got into a little conversation with a gentleman on the cars the other day. He was telling how farming was going to the bow-wows and was of no use whatever. And he was talking about the two institutes held recently in his vicinity. He said that if he could see the secretary of this Board, he would say to him, "What did you talk to those men about? Did you tell them to grow more potatoes, and more apples, or to produce more butter? What could you tell them to do?"

I asked that man something about his farming, as he was apparently a prosperous farmer. He said that he had a big farm, and was doing farming on a large scale, and that it took six men to take care of his farm. I commenced to inquire into the details, and found that he kept twenty cows. I asked him if he supposed one farmer keeping three cows was doing a big business. That was about the rate at which he was doing his farming. I said "If you are keeping six men to take care of twenty cows there is some mistake somewhere." We want to bring these things home to our farmer friends and to ourselves. We want to do our business as though it were business.

In regard to this question of good roads,—we want something done for our roads. We are afraid we shall spend something in getting good roads, but the great cost for the farmer to-day, in getting his products to market, is the cost of getting them to the depot. It costs about a cent a ton to move freight one mile on the railroads, and it costs more than a cent a hundred to move freight one mile by team. It costs nearly as much to get material up the eight miles from Bangor to Orono as it costs to get it from Portland or Boston to Bangor. We want to get better transportation, we want to learn how to reduce the cost of that item. If I were going to make one suggestion for institute work, it would be to try to instill business principles into the minds of our farmers. I believe that we must learn to do our business on a larger scale. I do not know but that the day of the very small farmer has got to go by. I think the day has pretty nearly gone by in which a man can wrest a living from the soil by brute strength. I think we have got to put brains into our farming if we are to make it a success. I want to influence our farmer friends to think more and work less, and I believe the agriculture of Maine will come to the front as it never has in the past.

W. S. WEEKS—I am very much surprised to be called upon at this time. I should have been quite pleased to have been called upon before President Harris spoke, but I am not so anxious now. I do not mean by that that he said what I should have said, but he said what I should have tried to say if I had attempted to say anything. I think that in our institute work we want men to come before us and tell us something that we do not know, and not to simply get together and exchange our own ideas. We want men who understand what they are talking about to present it to us so that we can understand it; and I think we want our institutes where we can get our crowd together, and it will not be many years before those who are outside will learn from their own conditions that they have got to come in with the majority.

SEC. McKEEN—I will just say that this idea of five-minute talks by different members of the Board has been a great help to me in the work of the institutes. It was instituted first two years ago, and it appears to me as I have listened to your suggestions this afternoon that they have been of more importance and more interest, and I hope will be of more value, than any suggestions made in the previous years. I agree very fully with all of them, particularly with the suggestions made by Dr. Harris.

Committee on field day called upon to report.

SEC. McKEEN—The committee on field day has held an informal meeting, but is not really ready to report. The idea was that we would take the matter into consideration a little more fully, and arrange it by correspondence. I will tell you an idea that occurred to me, and I would like to consult the members of the Board in regard to it. We were hardly in favor of paying the expenses of the Board for a field day in a distant part of the State, and omitting the meeting of the Board with the College at its annual field day. We thought it was possible that we might arrange to attend the field day at Orono, and then have a public meeting at some place near on the day following, at which we would have some good speakers, and attempt to have an interesting meeting. I would be glad to receive any suggestions in relation to that matter from any member of the Board.

PROF. WOODS—The State Agricultural College and the Maine Experiment Station is always open to receive this Board, and in the name of the president I would extend a most hearty invitation to you to hold that meeting in connection with our annual field meeting at the College, either on the day preceding or following, whichever shall seem best.

Voted, that the resolutions presented by Mr. Light in the Wednesday afternoon session, and laid upon the table, be now taken from the table and indefinitely postponed.

W. H. MOODY—I wish to present the amendment which I suggested yesterday: "An act to amend section 66 of chapter 18 of the Revised Statutes by striking out all of the fifth and sixth lines between the words 'dangerous' in the fifth line and 'under' in the sixth line, and also by adding to the paragraph as follows: and if the said surveyor or road commissioner has no available money on his way bill he shall be paid a fair compensation from the town treasury. And if the selectmen refuse to grant an order for said sum he may recover it by an action against the town as any other debt against the town may be recovered. So that the paragraph when amended may read as follows:

"Road commissioners and highway surveyors shall go over their highway districts, or cause it to be done, in April, May, June, August, September, October, and November, remove the loose obstructions to public travel and repair such defects as may occur from time to time, rendering travel dangerous, under a penalty of five dollars for neglect of such duty, to be recovered on complaint to a justice of the peace, half to go to the town and half to the complainant; and if the said surveyor or commissioner has no money available on his way bill he shall be paid a fair compensation from the town treasury, and if the selectmen refuse to grant him an order for the same, he may recover it by an action at law, the same as any other debt may be recovered."

As the matter has stood for years, the surveyors are required to do this, only it reads, "or they shall give notice of such defects to the municipal officers." That takes away the responsibility. They say that they have no money, and that they have complied with the law by giving notice to the municipal officers, and through the neglect of the town officers the matter goes on, and the roads are neglected. It seems to me that it would be of great benefit to us, without much expense, to have these stones removed. If the surveyor has no money on his way bill there is always money in the town treasury, but as a general thing he will have more or less money in his hands, as all the money is not expended in the spring of the year. I only added that clause because there are cases in which they do not have money and cannot do it, and it would not be fair to subject them to a penalty without giving them some opportunity of getting out of it. You all want to take advanced ground on road making, and what can you do with a little money that would do so much good as this? This is a small advance, but it will do a great deal of good. As the statutes read now the surveyor is fined $5.00 if he does not report to the municipal officers, but in my amendment he is fined $5.00 if he does not take out the rocks.

Voted to adopt this amendment and refer it to the committee on legislation.

Voted, that the thanks of the Board be extended to the president for efficient service.

Voted, that the Board send greetings, regards, and sympathy to the absent member.

Voted, that the thanks of the Board be extended to the railroads of the State for reduced fares.

T. E. SKOLFIELD—I want to call the attention of the executive committee to the holding of the next dairy conference at Westbrook. It has a large farming country around it, and Mr. Frye of Portland says that there are ample accommodation for taking care of every one who comes.

SEC. MCKEEN—It has generally been understood, I think, that we would go east for our next regular dairy meeting. Mr. Light went to Norway, a year ago, thinking it was very probable that he would like the next dairy meeting at Union. But when he saw the extent of preparation that would be necessary he rather concluded it was more than he wanted to handle, and thought a two days' meeting would do his people more good than the conference, under the circumstances. We went there in February following the dairy conference at Norway in December, and held a very successful two days' meeting, at which dairy matters were treated entirely. I would like to inquire if that is not Mr. Skolfield's idea,—to hold a two days' meeting at Westbrook.

MR. SKOLFIELD—My idea was to hold the regular dairy meeting at Westbrook. I simply wished to extend the invitation.

MR. HOLLAND—Last year an invitation was given to hold the next dairy meeting in Penobscot county. I find that the member from Aroostook county and also the member from Piscataquis county are desirous that that meeting should be held in Penobscot county, and I have had some idea that it might be held there. But I would not want it there unless all the members were satisfied. I am sure that it can do as much good in that part of the State as anywhere. Before the meeting will be held there will be four lines of electric railroads going into Bangor, and there are other railroads going through the city, making it a grand location for those who have implements to exhibit.

Adjourned.

VIEW IN APPLE ORCHARD OF PHINEAS WHITTIER, CHESTERVILLE.

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	S. G. Jerrard	Kenduskeag	G. M. Twitchell	Augusta	E. G. Eveleth	Auburn.
Eastern Maine Fair Association	F. O. Beal	Bangor	E. L. Stearns	Bangor	E. B. Nealey	Bangor.
Maine State Pomological	J. W. True	New Gloucester	D. H. Knowlton	Farmington	Chas. E. Wheeler,	Chesterville.
Androscoggin County	Lincoln Morrison	Livermore Falls.	J. L. Lowell	Auburn	C. H. Gibbs	Livermore Falls.
Androscoggin, Durham	W. S. Miller	W. Durham	F. H. Miller	West Durham	C. H. Bliss	Durham.
Aroostook County	Geo. W. Auber	Houlton	Ira J. Porter	Houlton	Geo. F. Merritt	Houlton.
Aroostook, North	Cyrus Chase	Blaine	A. E. Irving	Presque Isle	S. W. Duff	Presque Isle.
Cumberland County	Warren H. Vinton	Gray	Chas. H. Leighton	Cumberland Ml's	Fred D. Scammon	Gorham.
Cumberland, North	Richard Cook	Edes Falls	J. Orin Ross	Edes Falls	James Thomes	Harrison.
Cumberland Farmers' Club	C. A. Merrill	Cumberland Ctr.	N. M. Shaw	W. Cumberland	N. M. Shaw	W. Cumberland.
Cumberland, Gray Park Association,	Wm. P. Haskell	Gray	J. W. Stevens	Gray	J. W. Stevens	Gray.
Cumberland, Bridgton Farmers and Mechanics Association	Samuel S. Fuller.	Bridgton	I. S. Webb	Bridgton	I. S. Webb	Bridgton.
Cumberland, New Gloucester and Danville	S. R. Robinson	Danville Junct	L. L. Whitman	Upper Gloucester	Geo. C. Gordon	Upper Gloucester
Cumberland Lake View Park	Arthur Dyer	Sebago	J. P. Fitch	East Sebago	J. P. Fitch	East Sebago.
Franklin County	P. P. Tufts	Farmington	Arthur T. Moor	Farmington	Geo. M. Currier	Farmington.
Franklin, North	T. B. Hunter	West Freeman	M. Sewall Kelley,	Phillips	E. A. Peary	Phillips.
Hancock County	F. P. Merrill	Bluehill	Nahum Hinckley,	Bluehill	M. P. Hinckley	Bluehill.
Hancock Fair Association	A. W. Ellis	Ellsworth	H. F. Whitcomb	Ellsworth	Henry J. Joy	Ellsworth.
Hancock, North	H. T. Silsby	Aurora	A. W. Silsby	Amherst	A. W. Silsby	Amherst.
Kennebec County	M. F. Norcross	Winthrop	W. G. Hunton	Readfield	Wm. A. Lord	Readfield.
Kennebec, South	David Given	South Windsor	A. N. Douglass	Chelsea	Jasper S. Gray	South Windsor.
Kennebec, Pittston Agricultural and Trotting Park Association	C. C. Libby	East Pittston	G. R. Mansir	East Pittston	H. A. Clark	East Pittston.
Knox, North	Royal Grinnell	Union	A. M. Wingate	Union	S. N. Simmons	Appleton.
Lincoln County	John M. Glidden.	Newcastle	Albert I. Phelps	Damariscotta	A. A. Hall	Newcastle.
Oxford County	John A. Roberts.	Norway	A. C. T. King	South Paris	A. C. T. King	South Paris.
Oxford, Riverside Park Association,	C. M. Wormell	Bethel	S. N. Buck	Bethel	E. S. Kilborn	Bethel.
Oxford, West	A. R. Jenness	Fryeburg	T. L. Eastman	Fryeburg	W. R. Tarbox	Fryeburg.
Oxford, Androscoggin Valley	Geo. D. Bisbee	Rumford Falls	H. T. Tirrell	Canton	D. W. Goding	East Peru.
Oxford, North	Geo. O. Huse	Andover	John F. Talbot	Andover	Lewis C. Akers	Andover.
Penobscot County	Charles Sutton	Stillwater	Orren Bussell	Old Town	Orren Bussell	Old Town.
Penobscot, Lee Union	Ira Barnes	Lee	Nathan Averill	Lee	C. H. Tuck	Lee.
Penobscot, West	John Rogers	Stetson	T. P. Batchelder.	Kenduskeag	T. P. Batchelder.	Kenduskeag.
Penobscot, North	Edwin A. Reed	North Lee	L. W. Trask	Springfield	S. T. Mallett	South Springfield.
Penobscot and Aroostook	*John Burnham	Sherman Mills	L. B. Rogers	Patten	R. D. Gardner	Patten.

Penobscot, East Eddington Farmers' Club	J. H. Comins	East Eddington	E. B. Comins	East Eddington	J. H. Comins	East Eddington.
Penobscot, Orrington	Albert G. Dole	South Brewer	N. A. Nickerson	Orrington	N. A. Nickerson	Orrington.
Piscataquis, East	B. W. Doble	Milo	W. H. Snow	Milo	W. H. Snow	Milo.
Piscataquis, West	Frank Hart	Howard	E. R. Haynes	Monson	E. R. Haynes	Monson.
Sagadahoc County	J. F. Buker	Bowdoinham	W. S. Rogers	Topsham	L. E. Smith	Brunswick.
Somerset, East	P. W. Thompson	Hartland	S. H. Goodwin	St. Albans	S. L. Mayo	Hartland.
Somerset, Central	Warren Russell	Skowhegan	H. A. Archer	Skowhegan	A. R. Bixby	Skowhegan.
Somerset, West	C. M. Hilton	Madison	Ben Moore	North Anson	Ben Moore	North Anson.
Somerset, New Portland	W. R. Richardson	N. New Portland	H. W Kennison	N. New Portland	Elmer Quint	N. New Portland.
Waldo County	Joseph Ellis	South Brooks	G. G. Abbott	Belfast	S. T. Edgecomb	Belfast.
Waldo and Penobscot	M. C. Chapman	Newburgh	E. H. Nealley	Monroe	F. L. Palmer	Monroe.
Waldo, North	Edwin Rand	Unity	F. A. Bartlett	Unity	James H. Cook	Unity.
Waldo, West	Frank Bunker	Liberty	G. H Cargill	Liberty	A. C. Crockett	Liberty.
Washington County	A. S. Farnsworth	West Pembroke	H. F. Porter	Pembroke	N. S. Allan	Dennysville.
Washington, North	Waldo W. Mercier	Princeton	Irvin R Sprague	Princeton	S. G. Spooner	Princeton.
Washington, West	Jas. L. Bucknam	Columbia Falls	E. F. Allen	Columbia Falls	F. L. Allen	Columbia Falls.
Washington, Central	J. E. Vose	Machias	W. H. Phinney	Machias	M. Gardner	Machias.
York County	E. W. Staples	Biddeford	S. S. Andrews	Biddeford	Geo. H. Boothby	Saco.
York, Buxton and Hollis	J. W. Meserve	Bar Mills	J. B. Elden	Bar Mills	F. J. Leavitt	Hollis.
York, Ramshackle Park	Geo. E. Mitchell	West Newfield	John L. Carlton	West Newfield	U. B. Thompson	Maplewood.
York, Shapleigh and Acton	Edwin S. Lary	South Acton	Fred K. Bodwell	Acton	H. A. Stanley	Shapleigh.
York, Ossipee Valley	Howard Brackett	Cornish	James C. Ayer	Cornish	Walter P. Perkins	Cornish.
York, Sanford Agricultural and Mechanical Association	J. H. Makin	Springvale	A. W. Low	Springvale	I. A. Butler	Springvale.
York, North Berwick Agricultural Association	Nathaniel Hobbs,	North Berwick	Geo. W. Perkins	North Berwick	John B. Russell	North Berwick.

* Deceased.

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.	Sheep.	Swine.	Poultry, (coops.)
Androscoggin County	138	24	68	20	56	130	24	48	370	84	56	78
Androscoggin, Durham	22	-	9	6	10	48	8	12	93	35	4	38
Aroostook County	36	7	18	1	21	2	-	28	77	62	14	13
Aroostook, North	56	6	15	8	32	6	-	-	67	31	-	38
Cumberland County	91	11	38	-	46	134	22	24	275	57	61	134
Cumberland, North	35	-	-	6	14	80	8	6	114	-	-	-
Cumberland Farmers' Club	20	-	-	2	7	48	6	8	71	18	-	17
Cumberland, Gray Park Association	30	8	20	2	21	36	4	25	116	21	17	54
Cumberland, Bridgton Farmers' and Mechanics' Ass'n	25	2	1	-	5	22	2	-	57	-	11	14
Cumberland, New Gloucester and Danville	26	1	2	2	26	16	2	5	54	7	-	12
Cumberland, Lake View Park	36	-	-	2	14	32	4	-	52	3		-
Franklin County	-	-	-	-	-	-	-	-	600	300	40	25
Franklin, North	38	6	36	10	60	134	16	18	280	74	35	6
Hancock County	11	-	-	4	32	22	-	-	58	17	19	5
Hancock Fair Association	29	6	7	3	34	10	-	-	60	17	10	68
Hancock, North	19	2	10	-	14	22	-	-	48	3	4	7
Kennebec County	156	13	43	-	87	142	14	48	304	52	29	14
Kennebec, South	57	6	5	5	15	106	5	10	152	7	-	2
Kennebec, Pittston Agricultural & Trotting Park As..	18	4	6	2	27	130	13	25	207	23	2	6
Knox, North	29	6	10	4	34	44	12	21	131	34	19	13
Lincoln County	11	4	4	-	7	36	7	34	92	9	1	18
Oxford County	52	29	43	-	87	53	18	36	266	62	40	71
Oxford, Riverside Park Association	65	12	20	13	46	36	-	24	94	32	11	4
Oxford, West	74	9	26	2	17	76	9	26	165	57	38	21
Oxford, Androscoggin Valley	26	8	52	3	24	68	8	28	191	20	1	15
Oxford, North	28	4	20	4	15	30	8	6	87	32	13	9
Penobscot County	-	-	-	-	-	-	-	-	-	-	-	-

Penobscot, Lee Union	19	-	-	4	13	10	-	-	27	-	-	1
Penobscot, West	67	9	21	4	8	24	3	20	89	52	-	58
Penobscot, North	38	5	-	5	11	12	-	-	33	37	5	2
Penobscot and Aroostook	-	-	-	-	-	-	-	-	-	-	-	-
Penobscot, East Eddington Farmers' Club	14	1	4	2	15	4	-	-	26	24	2	10
Penobscot, Orrington	21	-	-	-	12	-	-	4	12	-	8	3
Piscataquis, East	-	-	-	-	-	-	-	-	-	-	-	-
Piscataquis, West	-	-	-	-	-	-	-	-	-	-	-	-
Sagadahoc County	30	30	107	-	97	126	6	125	365	40	18	75
Somerset, East	62	7	6	4	131	22	8	64	240	99	17	13
Somerset, Central	-	-	-	-	-	-	-	-	-	-	-	-
Somerset, West	-	-	-	-	-	-	-	-	-	-	-	-
Somerset, New Portland	-	-	-	-	-	-	-	-	-	-	-	-
Waldo County	-	-	-	-	-	-	-	-	-	-	-	-
Waldo and Penobscot	59	10	19	6	32	84	17	86	254	62	18	50
Waldo, North	12	3	-	4	48	18	2	-	75	24	30	5
Waldo, West	-	-	-	-	-	-	-	-	-	-	-	-
Washington County	26	4	19	-	32	2	-	30	87	48	39	28
Washington, North	-	-	-	-	-	-	-	-	-	-	-	-
Washington, West	78	9	17	-	29	30	-	-	85	35	32	42
Washington, Central	30	9	13	-	23	14	-	-	59	24	38	36
York County	27	7	12	-	10	32	4	-	65	20	12	33
York, Buxton and Hollis	32	2	4	5	59	40	2	38	110	7	3	14
York, Ramshackle Park	22	1	2	4	14	88	6	-	115	6	2	2
York, Shapleigh and Acton	18	-	-	11	28	180	10	-	229	15	7	42
York, Ossipee Valley	25	10	19	-	18	217	10	12	286	12	2	4
York, Sanford Agricultural and Mechanical Ass'n	12	6	30	12	10	104	10	-	172	30	20	23
York, North Berwick Agricultural Association	60	3	10	5	15	90	4	20	147	25	50	2

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	$33 00	$18 00	$10 00	$10 00	$9 00	$10 00	$12 00	$65 00	$48 00
Androscoggin, Durham	-	3 00	-	-	3 00	3 00	-	12 00	6 00
Aroostook County	6 00	4 00	10 00	6 00	5 00	6 00	-	24 00	14 00
Aroostook, North	-	6 00	3 00	6 00	11 00	3 50	-	38 00	7 50
Cumberland County	45 00	30 00	-	-	20 00	-	-	20 00	57 00
Cumberland, North	1 50	-	-	-	-	1 00	3 00	-	93 00
Cumberland Farmers' Club	3 00	3 00	-	-	-	10 00	-	10 00	-
Cumberland, Gray Park Association	15 00	-	-	-	5 00	15 00	18 00	9 00	-
Cumberland, Bridgton, Farmers' and Mechanics' Association	-	-	-	-	3 00	5 00	3 00	1 00	28 00
Cumberland, New Gloucester and Danville	5 00	-	-	-	3 00	8 00	5 00	8 00	6 00
Cumberland, Lake View Park	8 00	2 00	-	-	-	-	-	14 00	12 00
Franklin County	-	-	11 00	3 00	6 00	6 00	10 00	-	12 00
Franklin, North	-	-	6 00	4 50	-	3 50	3 50	9 30	5 00
Hancock County	5 00	-	-	-	-	-	-	16 00	3 00
Hancock Fair Association	11 00	6 00	8 00	-	-	-	7 00	22 50	20 00
Hancock, North	-	-	-	-	-	-	-	4 25	4 00
Kennebec County	-	10 00	24 00	10 00	10 00	10 00	6 00	51 50	34 00
Kennebec, South	2 50	4 50	2 50	-	2 65	3 50	4 50	8 75	8 00
Kennebec, Pittston Agricultural and Trotting Park Association.	1 50	1 00	1 50	50	1 75	1 00	-	5 50	1 00
Knox, North	3 00	-	-	3 00	3 00	2 50	2 50	7 00	7 50
Lincoln County	-	-	-	-	-	-	-	-	-
Oxford County	-	-	72 00	29 00	20 00	36 00	12 00	47 00	93 00
Oxford, Riverside Park Association	16 00	9 00	-	-	4 50	25 00	-	9 80	38 00
Oxford, West	10 00	7 00	3 00	4 00	7 00	4 00	7 00	8 00	27 00
Oxford, Androscoggin Valley	14 00	9 00	-	-	-	10 00	6 00	18 00	10 00
Oxford, North	6 00	3 50	-	-	-	10 00	-	6 70	20 00
Penobscot County	-	-	-	-	-	-	-	-	-

Penobscot, Lee Union	–	–	–	1 75	–	–	–	2 75	5 00
Penobscot, West	11 00	4 00	4 00	6 00	–	–	–	21 00	23 00
Penobscot, North	–	–	2 00	6 00	–	4 50	–	20 25	4 50
Penobscot and Aroostook	–	–	–	–	–	–	–	–	–
Penobscot, East Eddington Farmers' Club	–	–	–	–	2 50	2 50	–	4 00	1 50
Penobscot, Orrington	–	3 00	–	–	8 00	3 00	–	8 25	8 00
Piscataquis, East	–	–	–	–	–	–	–	–	–
Piscataquis, West	–	–	–	–	–	–	–	–	–
Sagadahoc County	24 00	5 00	6 00	5 00	10 00	15 00	–	18 00	16 00
Somerset, East	–	13 50	5 00	–	–	10 00	9 00	19 50	65 00
Somerset, Central	–	–	–	–	–	–	–	–	–
Somerset, West	–	–	–	–	–	–	–	–	–
Somerset, New Portland	–	–	–	–	–	–	–	–	–
Waldo County	–	–	–	–	–	–	–	–	–
Waldo and Penobscot	28 00	7 00	10 00	4 00	10 00	10 00	8 00	19 00	46 00
Waldo, North	7 00	6 00	–	–	4 50	6 00	5 00	6 00	5 00
Waldo, West	–	–	–	–	–	–	–	–	–
Washington County	11 00	5 00	–	9 00	–	–	5 00	41 00	5 00
Washington, North	–	–	–	–	–	–	–	–	–
Washington, West	34 00	9 00	25 00	7 00	–	50 00	3 00	118 00	36 00
Washington, Central	6 00	4 00	–	4 00	–	9 00	–	23 00	18 00
York County	23 00	15 00	–	–	–	–	8 00	25 00	14 00
York, Buxton and Hollis	8 00	5 00	–	–	–	–	5 00	8 00	22 00
York, Ramshackle Park	–	–	8 00	8 00	–	37 00	4 00	25 00	–
York, Shapleigh and Acton	–	–	–	–	6 00	6 00	–	8 75	–
York, Ossipee Valley	23 00	8 00	–	–	8 00	10 00	8 00	25 00	–
York, Sanford Agricultural and Mechanical Association	5 00	–	–	3 00	3 00	4 00	–	5 00	–
York, North Berwick Agricultural Association	8 00	5 00	–	–	4 00	–	–	15 00	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	$65 00	$84 00	-	$90 00	$36 00	$36 00	$36 00	$9 00	$28 00	$82 00	$76 00
Androscoggin, Durham	-	12 00	$7 50	7 50	6 00	-	15 00	3 00	6 00	-	18 00
Aroostook County	26 00	56 00	4 00	35 00	38 00	4 00	-	-	-	-	-
Aroostook, North	20 50	39 00	10 50	32 50	-	10 00	-	-	-	-	-
Cumberland County	38 00	110 00	-	36 00	32 00	40 00	40 00	-	26 00	34 00	118 00
Cumberland, North	-	-	9 00	5 00	5 00	6 00	14 00	10 00	6 00	15 00	93 00
Cumberland Farmers' Club	-	-	3 00	9 00	9 00	9 00	7 00	6 00	9 00	36 00	15 00
Cumberland, Gray Park Association	12 00	28 50	2 00	21 50	14 00	3 00	9 00	-	5 00	36 00	48 00
Cumberland, Bridgton F. and M. Association	3 00	-	-	6 00	-	-	-	-	1 00	5 00	23 00
Cumberland, New Gloucester and Danville	3 00	6 00	3 00	21 00	-	-	7 00	-	2 00	-	10 00
Cumberland, Lake View Park	-	-	3 00	17 00	-	7 50	3 00	-	2 06	7 00	13 00
Franklin County	30 00	51 75	24 50	43 75	27 00	9 00	29 00	3 00	11 00	81 00	42 00
Franklin, North	7 50	12 00	6 25	9 65	8 00	6 50	8 00	2 00	7 50	36 00	3 00
Hancock County	-	-	13 00	44 00	-	20 00	-	-	-	-	19 00
Hancock Fair Association	22 50	32 00	1 00	39 75	-	17 00	-	-	-	-	18 00
Hancock, North	2 00	8 25	-	5 75	-	6 00	1 25	-	-	-	6 00
Kennebec County	17 00	49 00	-	37 00	24 00	30 00	19 00	12 00	19 50	45 00	30 00
Kennebec, South	7 60	6 25	7 75	12 25	6 00	10 85	18 25	-	3 50	40 08	10 00
Kennebec, Pittston Agricultural and Trotting Park As.	3 00	4 63	1 25	7 63	3 00	5 00	5 12	75	4 50	17 24	8 50
Knox, North	7 50	7 50	1 50	19 00	12 00	6 00	7 50	3 00	6 00	6 00	8 00
Lincoln County	-	-	-	-	-	-	-	-	-	-	-
Oxford County	121 00	130 00	-	148 00	36 00	120 00	38 00	-	22 00	71 00	87 00
Oxford, Riverside Park Association	19 50	10 00	9 50	22 00	8 00	14 00	9 37	3 00	-	24 00	34 00
Oxford, West	32 00	52 00	-	20 00	20 00	25 00	36 00	6 00	14 50	48 00	59 00
Oxford, Androscoggin Valley	22 00	38 50	6 00	18 00	15 00	25 00	27 00	-	6 00	16 00	41 00
Oxford, North	-	-	5 00	13 00	8 00	9 50	6 25	2 00	5 25	-	21 75
Penobscot County	-	-	-	-	-	-	-	-	-	-	-

Penobscot, Lee Union.	-	-	3 50	5 75	-	2 00	-	-	-	-	1 50
Penobscot, West	23 00	46 25	3 25	13 00	12 00	32 00	-	-	6 00	-	20 00
Penobscot, North	3 00	11 50	2 00	20 00	-	11 00	2 00	-	-	3 00	-
Penobscot and Aroostook	-	-	-	-	-	-	-	-	-	-	-
Penobscot, East Eddington Farmers' Club	1 00	2 75	2 00	7 75	-	-	-	-	-	-	-
Penobscot, Orrington	-	-	-	6 00	4 00	-	-	-	-	-	-
Piscataquis, East	-	-	-	-	-	-	-	-	-	-	-
Piscataquis, West	-	-	-	-	-	-	-	-	-	-	-
Sagadahoc County	86 50	144 75	-	115 00	54 00	58 00	26 00	5 00	9 00	56 00	39 00
Somerset, East.	20 00	-	6 50	65 00	31 00	7 00	9 00	3 00	11 00	-	8 00
Somerset, Central	-	-	-	-	-	-	-	-	-	-	-
Somerset, West	-	-	-	-	-	-	-	-	-	-	-
Somerset, New Portland	-	-	-	-	-	-	-	-	-	-	-
Waldo County	-	-	-	-	-	-	-	-	-	-	-
Waldo and Penobscot	24 00	45 00	8 00	35 00	52 00	29 00	10 00	6 00	30 00	36 00	46 00
Waldo, North	9 00	-	9 00	32 50	-	16 00	-	-	4 00	-	-
Waldo, West	-	-	-	-	-	-	-	-	-	-	-
Washington County	10 00	22 00	-	24 50	28 00	3 00	-	-	-	-	-
Washington, North	-	-	-	-	-	-	-	-	-	-	-
Washington, West	39 00	30 00	-	26 00	-	40 00	-	-	-	-	36 00
Washington, Central	27 00	21 00	-	19 00		21 00	-	-	-	-	-
York County	13 50	21 00	-	19 00	-	21 00	10 00	-	7 00	45 00	45 00
York, Buxton and Hollis	5 00	11 00	3 00	41 00	12 00	5 00	-	4 00	5 00	18 00	-
York, Ramshackle Park	3 00	6 00	6 00	18 00	-	30 00	2 00	-	9 00	17 00	20 00
York, Shapleigh and Acton	-	-	8 25	20 25	-	6 00	32 00	-	6 00	55 00	17 00
York, Ossipee Valley	32 00	55 00	-	33 00	16 00	40 00	35 00	6 00	10 00	40 00	28 00
York, Sanford A. and M. Association	7 00	33 00	-	6 00	-	8 00	3 00	3 00	3 00	12 00	13 00
York, North Berwick Agricultural Association	4 00	5 00	10 00	16 00	20 00	10 00	2 00	-	5 00	18 00	5 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 premiums and gratuities paid.
Maine State Pomological	-	-	-	-	$1352 75	-	-	-	-	-	$1,352 75
Androscoggin County	$75 00	$68 00	$52 00	$78 00	68 00	$43 00	$18 50	$5 00	$107 00	$195 75	1,467 25
Androscoggin, Durham	13 00	6 50	14 25	21 30	12 40	3 80	7 90	-	21 55	14 00	216 70
Aroostook County	41 00	4 00	7 50	64 60	14 20	9 15	-	-	15 85	75	*395 05
Aroostook, North	12 75	-	34 75	88 70	101 90	27 00	7 50	-	80 60	102 79	643 48
Cumberland County	38 00	12 00	119 00	38 00	34 25	40 25	-	6 00	20 00	21 50	975 00
Cumberland, North	-	8 00	-	16 25	18 50	3 50	-	-	7 00	19 25	334 00
Cumberland Farmers' Club	6 00	-	7 50	14 50	15 25	2 00	-	-	21 50	2 25	198 00
Cumberland, Gray Park Association	5 00	3 00	17 25	13 25	12 00	6 65	1 50	-	15 75	13 25	328 65
Cumberland, Bridgton Farmers' & Mechanics' Ass'n	-	3 00	-	3 20	9 25	-	-	2 00	23 05	14 27	132 77
Cumberland, New Gloucester and Danville	2 00	-	6 50	10 50	13 75	5 90	-	-	18 25	9 00	153 50
Cumberland, Lake View Park	1 00	-	-	12 50	13 25	2 70		-	7 25	-	125 20
Franklin County	97 50	8 50	26 50	15 60	40 00	60	18 00	25 00	31 35	121 20	784 25
Franklin, North	15 00	5 00	2 00	13 80	16 40	5 40	1 50	-	26 85	22 00	246 15
Hancock County	16 00	4 00	5 00	38 75	20 38	8 20	3 60	-	33 50	3 75	253 18
Hancock Fair Association	13 75	7 25	42 70	113 50	82 75	50 00	9 50	-	116 85	5 00	646 05
Hancock, North	1 50	2 50	2 50	26 20	22 75	5 10	3 85	1 00	38 30	6 00	147 20
Kennebec County	25 50	18 00	21 50	6 00	88 75	33 25	9 00	-	84 75	120 05	844 80
Kennebec, South	1 50	-	50	14 50	17 05	5 90	50	-	31 05	6 25	236 68
Kennebec, Pittston Agr'lt'l & Trotting Park Ass'n	3 75	1 25	1 25	9 87	10 35	1 25	-	-	3 48	50	106 07
Knox, North	10 00	4 50	6 50	9 50	27 75	11 25	4 90	18 75	-	5 50	211 15
Lincoln County	-	-	-	-	-	-	-	-	-	-	-
Oxford County	35 00	25 00	19 50	40 25	55 25	58 50	14 25	31 00	34 20	224 50	1,619 45
Oxford, Riverside Park Association	12 00	11 50	4 50	11 57	20 00	8 50	-	-	14 15	14 00	351 89
Oxford, West	26 00	24 00	13 50	33 25	14 75	28 35	3 25	9 50	46 75	8 00	596 85
Oxford, Androscoggin Valley	17 50	3 00	12 00	15 75	26 15	8 50	5 50	6 00	13 50	41 20	430 60
Oxford, North	7 00	3 00	4 50	17 50	6 85	8 25	3 10	-	19 45	10 05	196 65
Penobscot County	-	-	-	-	-	-	-	-	-	-	-

Penobscot, Lee Union	-	-	50	2 75	3 75	2 25	50	-	10 25	-	42 25
Penobscot, West	20 00	-	41 50	24 30	28 55	17 25	2 00	-	111 70	12 80	482 60
Penobscot, North	4 00	3 00	1 00	5 00	8 15	3 75	-	-	21 60	-	136 25
Penobscot and Aroostook	-	-	-	-	-	-	-	-	-	-	-
Penobscot, East Eddington, Farmers' Club	5 50	1 00	2 75	26 35	14 30	5 25	3 00	-	7 90	3 00	93 05
Penobscot, Orrington	-	4 00	1 25	18 60	28 60	4 40	1 00	-	23 75	13 25	135 10
Piscataquis, East	-	-	-	-	-	-	-	-	-	-	-
Piscataquis, West	-	-	-	-	-	-	-	-	-	-	-
Sagadahoc County	20 00	19 00	40 50	133 50	103 00	48 75	16 00	-	71 50	447 60	1,592 10
Somerset, East	42 50	15 00	19 00	19 50	6 20	30 25	6 75	-	19 50	7 00	448 20
Somerset, Central	-	-	-	-	-	-	-	-	-	-	-
Somerset, West	-	-	-	-	-	-	-	-	-	-	-
Somerset, New Portland	-	-	-	-	-	-	-	-	-	-	-
Waldo County	-	-	-	-	-	-	-	-	-	-	-
Waldo and Penobscot	27 00	8 00	18 25	43 00	46 00	13 75	8 25	-	145 20	-	772 45
Waldo, North	10 00	3 75	2 75	30 50	13 25	16 50	-	-	39 00	37 60	263 35
Waldo, West	-	-	-	-	-	-	-	-	-	-	-
Washington County	17 50	14 00	21 75	59 00	25 35	12 75	75	-	61 85	2 00	378 45
Washington, North	-	-	-	-	-	-	-	-	-	-	-
Washington, West	33 00	15 00	38 75	126 00	95 10	24 25	5 00	-	65 20	89 05	944 35
Washington, Central	15 00	15 00	25 00	56 25	35 25	14 65	-	-	74 45	10 00	397 60
York County	14 00	11 00	21 00	29 50	6 00	-	-	-	-	65 00	413 00
York, Buxton and Hollis	4 50	7 00	12 00	9 00	4 75	1 50	-	-	19 60	5 50	215 85
York, Ramshackle Park	6 00	5 00	1 50	12 25	50	-	.	-	14 00	-	232 25
York, Shapleigh and Acton	5 50	10 00	17 50	59 00	23 75	7 75	-	-	5 25	101 25	395 25
York, Ossipee Valley	5 00	4 00	3 50	15 00	13 00	3 25	-	-	29 05	15 00	464 80
York, Sanford Agricultural and Mechanical Ass'n	11 00	18 00	24 00	23 00	10 00	8 00	-	-	15 30	-	217 30
York, North Berwick Agricultural Association	4 50	8 00	2 00	35 00	3 00	2 50	-	-	19 50	43 00	249 50

* Discount, 47+ per cent, $188.10.

FINANCES.

Name of Society.	Amount received from the State.	Receipts for membership.	Receipts from loans.	Receipts from entry fees for trotting purses.	Receipts from all other sources.	Total receipts.	Amount expended in improvements.	Amount expended in trotting purses.	Expenses during the fair.	Total amount paid out.	Value of property belonging to society.	Amount of liabilities.
Maine State Pomological	$1,000 00	$122 00	-	-	$1,135 00	$2,257 00	-	-	$277 61	$2,206 19	$1,500 00	$200 00
Androscoggin County	489 58	10 00	$700 00	$290 00	1,102 24	2,591 82	$312 17	$700 00	548 87	3,028 29	1,000 00	1,000 00
Androscoggin, Durham	70 23	-	-	165 00	346 60	581 83	25 00	350 00	306 70	898 40	2,000 00	1,300 00
Aroostook County	123 18	30 00	-	-	179 20	332 38	-	-	89 00	332 38	-	320 00
Aroostook, North	224 74	65 50	-	257 00	846 18	1,393 39	-	423 00	208 92	1,399 31	4,000 00	2,919 00
Cumberland County	388 77	20 00	450 00	870 00	2,889 85	4,618 62	215 80	1 650 00	1,264 39	4,105 19	6,000 00	1,300 00
Cumberland, North	95 46	-	-	66 50	395 68	557 64	40 00	230 00	180 00	784 53	2,300 00	226 89
Cumberland Farmers' Club	75 36	5 00	-	120 00	473 07	673 43	-	275 00	383 56	856 56	3,000 00	300 00
Cumberland, Gray Park Association	144 00	1 00	-	393 50	1,188 95	1,727 45	-	650 00	852 88	1,831 53	9,000 00	1,600 00
Cumberland, Bridgton F. and M. Association	81 31	205 00	-	286 00	1,746 04	2,318 35	1,046 83	750 00	519 84	2,449 44	1,000 00	776 36
Cumberland, New Gloucester and Danville	66 37	5 00	-	50 75	590 12	712 24	70 00	189 00	251 12	687 87	2,500 00	-
Cumberland, Lake View Park	31 80	-	-	85 00	395 37	512 17	-	351 00	113 20	589 40	1,100 00	160 00
Franklin County	280 35	660 00	-	230 50	1,361 28	2,532 13	-	910 00	494 00	2,188 25	10,000 00	-
Franklin, North	76 64	273 50	165 00	90 00	291 07	896 21	215 37	327 50	30 00	819 02	3,077 19	2,390 00
Hancock County	87 84	-	-	172 50	1,178 26	1,438 60	-	545 00	369 78	1,169 96	5,000 00	1,200 00
Hancock Fair Association	166 29	-	-	226 50	2,683 68	3,076 47	237 42	790 00	1,385 00	3,058 47	11,500 00	-
Hancock, North	35 42	10 00	27 25	-	261 94	334 61	-	-	169 37	316 57	18 04	-
Kennebec County	275 00	-	50 00	278 75	1,252 55	1,856 30	159 58	650 00	613 77	2,268 15	3,000 00	709 00
Kennebec, South	73 08	-	-	133 00	1,337 32	1,543 40	91 34	402 50	293 30	1,023 82	1,500 00	-
Kennebec, Pittston Agr. & Trotting Park As'n.	60 07	35 00	-	47 00	560 10	702 17	33 12	210 16	315 93	665 28	1,500 00	506 50
Knox, North	174 15	219 75	100 00	132 00	326 35	952 25	71 41	315 80	346 96	945 32	-	100 00
Lincoln County	-	-	275 00	23 75	19 50	318 25	-	95 00	223 25	318 25	1,000 00	360 40
Oxford County	391 69	28 00	-	411 50	3,838 71	4,669 90	-	1,199 50	493 98	4,342 62	10,000 00	92 41
Oxford, Riverside Park Association	129 00	-	-	103 75	683 01	915 76	75 00	650 00	237 00	1,313 89	-	350 00
Oxford, West	196 29	1614 99*	-	407 50	-	2,218 78	117 00	875 00	-	2,100 00	7,600 00	2,000 00
Oxford, Androscoggin Valley	195 67	14 00	-	264 10	1,155 14	1,628 91	141 90	652 40	484 53	1,709 43	2,500 00	3,465 71
Oxford, North	78 87	-	-	93 50	818 92	991 29	-	405 00	38 00	953 23	3,000 00	-
Penobscot County	-	-	-	-	-	-	-	-	-	-	-	-

Penobscot, Lee Union	17 65	2 00	-	-	19 20	38 85	-	-	13 50	55 75	-	16 90
Penobscot, West	211 18	86 00	-	157 00	667 38	1,121 56	-	330 00	123 99	936 59	2,500 00	2,000 00
Penobscot, North	-	21 00	47 69	51 21	23 00	142 90	-	-	10 00	146 25	-	-
Penobscot and Aroostook	-	-	-	-	-	-	-	-	-	-	-	-
Penobscot, East Eddington Farmers' Club	26 48	-	-	-	222 71	249 19	-	-	69 92	162 97	1,500 00	-
Penobscot, Orrington	35 38	-	10 82	45 75	662 30	754 25	380 42	193 00	197 53	906 05	1,100 00	550 00
Piscataquis, East	-	-	-	-	-	-	-	-	-	-	-	-
Piscataquis, West	-	-	-	-	-	-	-	-	-	-	-	-
Sagadahoc County	543 79	472 00	200 00	516 25	2,647 17	4,379 21	445 25	785 00	†3,148 96	5,971 31	5,000 00	2,205 31
Somerset, East	104 70	86 00	-	282 25	533 84	1,006 79	92 12	615 00	275 87	1,431 19	3,500 00	2,857 17
Somerset, Central	-	-	-	-	-	-	-	-	-	-	-	-
Somerset, West	-	-	-	-	-	-	-	-	-	-	-	-
Somerset, New Portland	-	-	-	-	-	-	-	-	-	-	-	-
Waldo County	-	-	-	-	-	-	-	-	-	-	-	-
Waldo and Penobscot	250 00	-	4 49	558 75	2,856 29	3,669 53	907 13	1,160 00	662 55	3,502 13	4,000 00	-
Waldo, North	115 10	20 00	-	134 50	377 02	646 62	-	340 00	200 31	803 66	-	157 04
Waldo, West	-	-	-	-	-	-	-	-	-	-	-	-
Washington County	138 86	13 00	-	300 00	956 95	1,408 81	50 00	600 00	593 02	1,621 47	1,800 00	775 00
Washington, North	78 17	-	-	195 00	393 06	666 23	-	450 00	216 23	666 23	3,000 00	1,600 00
Washington, West	278 67	1 00	-	208 00	2,458 59	2,946 26	-	597 50	870 78	2,965 95	1,817 00	420 64
Washington, Central	130 52	10 00	-	230 00	787 65	1,158 17	-	570 00	198 38	1,165 98	-	1,100 00
York County	165 05	5 00	-	346 87	2,130 08	2,647 00	100 00	825 00	-	2,622 53	7,000 00	7,000 00
York, Buxton and Hollis	71 88	-	-	238 00	607 85	917 73	-	580 00	187 72	983 57	3,100 00	1,042 95
York, Ramshackle Park	65 20	-	-	252 00	523 25	840 45	100 00	500 00	260 00	1,092 25	4,500 00	352 30
York, Shapleigh and Acton	122 42	207 00	60 00	-	54 83	444 25	-	-	31 05	426 30	2,000 00	-
York, Ossipee Valley	200 00	-	316 32	700 00	1,774 99	2,991 31	-	1,180 00	636 37	2,934 61	6,500 00	2,277 36
York, Sanford A. and M. Association	88 40	-	-	215 00	710 20	1,013 60	206 30	455 00	303 86	965 16	5,000 00	132 02
York, North Berwick Agricultural Association	97 12	-	-	209 19	3,193 55	3,499 86	‡2,723 78	472 00	3,445 28	8,000 00	1,182 46	5,677 67

*Includes gate money. †Includes loan repaid, and expenses during the year. ‡Includes amount paid on debt-

REPORT OF PROCEEDINGS

OF

STATE DAIRY MEETING,

Held at Skowhegan, December 2d and 3d, 1896.

Wednesday, A. M. Meeting called to order by President W. H. Vinton.

ADDRESS OF WELCOME.

By Gen. R. B. Shepherd.

Gentlemen of the Maine State Dairying Association:

It gives me pleasure on behalf of the citizens of our town to extend to you a cordial and hearty welcome. We are pleased to have you come here to discuss principles, perform experiments and conduct scientific investigations that lead to more intelligent and profitable methods in this branch of agriculture.

The display here, of improved implements employed in your industry, the powers enlisted in your service, are a hopeful sign of a brighter and happier future. There is an inspiration in thinking what the future of dairying may be, when so much has been accomplished in so few years.

Too much credit cannot be given to you gentlemen, and to our very efficient secretary of the board of agriculture for the intelligence and energy he has displayed in collecting facts and statistics and disseminating them among the people.

And while agriculture is among the earliest pursuits of civilized man, there has been little or no progress until recent years in scientific agriculture. It is true the improved implements

FARM HOME OF HON. R. W. ELLIS OF EMBDEN.

for cultivating the soil have kept pace in a measure with the improved machinery in other departments of business. Schools and colleges have been in operation for hundreds of years to educate men for the professions of law, medicine, divinity, literature and general business; but not until within the last forty years has there been a thought of an educated farmer.

Not until 1857 was there any movement in this country toward establishing a school in which the principles of agriculture should be taught. About this time Horace Mann, that prince of educators, established in the state of Michigan a school in which instruction in agriculture was a special feature.

By the munificence of the general government there have now been established an agricultural college and an experiment station in every state, and for the purpose of defraying the expenses of professors and teachers, congress makes an annual appropriation to each college and experiment station of about $40,000.

Professors and teachers to the number of 1,500 are engaged in giving instructions and in experimental work. The number of students at the close of the fall term of 1896, studying in our agricultural colleges, was a trifle over 5,000.

But farmers' sons in many of the states, especially in the East, have been slow to avail themselves of the opportunities furnished for the scientific study of agriculture. In the West a much larger number, seventy-five of eight per cent. of the students, take the course in agriculture and adopt it as profession after graduation.

In the East the course of agriculture has not been a favorite. The course of civil, mechanical and electrical engineering has presented greater attractions and more ready means of earning a competence. So that of the 468 living graduates of the Maine State College only thirty-seven are engaged in agricultural pursuits, or a little more than eight per cent. This does not include those who have taken the short course in agriculture or who have studied in the dairy schools.

We as farmers of the State of Maine have been slow to believe in our college. Our course has been one of hesitation and uncertainty. Now it would seem that the time of hesitation and lack of interest is past. If our abandoned farms are to be reoccupied; if fertility is to be restored to our exhausted soil;

if farming is to become a flourishing, prosperous business; if farmers are to become educated, intelligent, scientific men, then must our agricultural colleges and experiment stations devise the methods and point out the way. If insect pests are to be destroyed or rendered harmless, if disease in animals is to be stayed or eradicated, we must look to our agricultural colleges and experiment stations to devise the means and develop the methods.

Let us then be loyal to our college, have faith in her methods, have faith in her ability to unlock the secret treasures that lie hidden in the soil. Let us have faith like the old negro preacher in Georgia, who at the close of his service was accustomed to announce the subject of the next Sunday's discourse. On this occasion he gave out his subject for the next Sabbath, "The Creation of Woman." His master's boys, desiring to have some fun with the old preacher, contrived to paste two leaves of the Bible together so that the text would in part be from the description of the creation and in part from the building of Noah's ark. The old preacher opened his Bible and read, "And the rib which the Lord, God had taken from man made He woman," and turning over the leaf he read, "and he pitched her within and he pitched her without." He stopped and said, "Brethren, I never read that passage before, but it is in the Bible and I believe it. It shows that woman is fearfully and wonderfully made." Such faith should we have in our colleges, for it is such faith that moves the world.

A boy from the farm should receive such an education at the college that he will be able to go back to the farm fitted to take up the real work of the farm as an intelligent, educated, scientific, progressive farmer.

The possibilities that may arise from scientific investigations in agriculture are beyond the scope of the most vivid imagination. When plants under favorable environment are supplied with proper nourishment—a stalk of corn for instance, usually produces one ear, rarely two, more rarely three, but each stalk has ten or twelve joints, and each joint under favorable circumstances is capable of producing an ear of corn. Who can say that scientific investigation may not enable us to raise ten or twelve ears to the stalk and increase the yield per acre from forty or fifty bushels to three or four hundred bushels per acre.

Some experiments are now in progress in developing new races of grain of which there is an indicated yield of one or two hundred bushels per acre. One is almost bewildered when he thinks of the practical results that may follow from the scientific investigations of all the experiment stations and the teaching of all the agricultural colleges. The mind of the most sanguine fails to grasp the possibilities of the future of agriculture. "He who makes two blades of grass where one grew before has not lived in vain."

RESPONSE.

By W. G. Hunton.

Mr. President, Ladies and Gentlemen:

I am glad to-day that I am alive and in Skowhegan. I am glad that in a public manner I can represent the farmers of Maine to-day, and more glad that I am a farmer myself in the good old State of Maine. This is about the sixth meeting of this kind that has been holden in our State, and from the first we have realized the benefits which we are deriving from such meetings. As your speaker has just said, the time has passed in which the farmer with any degree of hesitation can apply education, knowledge, and intelligence to his business. We fully realize to-day that if we want to succeed in farming, if we want to succeed in the different branches of agriculture, we must apply that same amount of brains and intelligence to the work that all other business men are applying to their business. We must have an interchange of ideas; we must understand the improved methods and pursue those methods, or we get sadly left behind. And to accomplish this we must endeavor to associate ourselves with men who are making agriculture their study, who are making one particular branch of it their study, and from them we can get ideas that we can use to our own advantage. We are here to-day for business. In the first of these meetings perhaps pleasure was thought of before business, but we have realized each year more and more that the people attend these meetings for business; they attend them for profit to themselves; and that is precisely the idea which we wish to establish, precisely the idea which will do us good.

Now we, as members of the Board, in behalf of the Board, appreciate the kindness and cordial welcome which have been offered to us by the people of Skowhegan. We appreciate the fact that they have endeavored in every manner to anticipate all our wants, and to make this a profitable meeting. And it remains with us, it remains with the Board of Agriculture, and with the farmers, and with the representatives of these different articles used in our work, to make it profitable and successful. And no man can look upon this audience without seeing that they are here to make the most of it. Let us, therefore, by an interchange of ideas, let us by questions, in every way in which we are able, draw forth from those who have knowledge in these particular lines as much of their knowledge as possible, and take it home with us, and show to the world that the farmers of Maine can apply brains to their business, can gain success from these old rocky farms in Maine which perhaps will be as permanent and as pronounced as the success of some of our brethren who live in more favored localities. The time never was when the farmers of Maine realized so fully that it is from the cow that they will obtain success as they do to-day. The farmers of Maine never have realized, perhaps, more thoroughly, that it is from this line, and from education in this line that they can obtain success in the State of Maine. Go where we will over the State, we find that every dairy section is immediately known by its appearance. And I say here that the farmers of Maine as farmers, the Board of Agriculture in its public capacity, can do no better work for the State than to encourage every man, and encourage everything that will in any way assist in encouraging the farmers, in this particular line. Therefore I say that it is our duty to do all we can, as farmers and citizens of the State, to make this meeting successful, by our own individual efforts.

Thanking the people of Skowhegan for their very cordial welcome, and for their efforts in our behalf, I will give an opportunity for the more instructive articles of the day.

REVIEW OF OUR DAIRY INTERESTS.

By Prof. G. M. Gowell.

Mr. Chairman, Ladies and Gentlemen:

I assure you that it is with a good deal of uncertainty that I undertake to talk about something that I do not know anything about. You know we have no dairy organization in the State. This meeting is held here under the auspices of the Board of Agriculture, and we dairymen come here to take advantage of the work of that Board. Now I wanted to know something about the number of cows we had in the State of Maine, the amount of money receipts, and the number of men who were engaged in this work. We have grown up into this leading specialty and are making it our life work, many of us, and I did not even know where all the creameries and cheese factories were located. I had a pretty good list, and I wrote to the members of the Board to review their counties, and in this way I revised this list so that we know pretty nearly where they all are; and then I sent out circular letters to these creamery managers, and I have got a little data to-day. I find that we have forty-eight creameries in the State, thirty-three of which have made returns. We have seven cheese factories in the State, and three of these have made returns. I asked only about half a dozen questions. I did not dare to ask too many, as it does not do to talk to people too much about their business, particularly if they think they have a business of their own. I did ask them the number of cows that furnished them cream, the number of patrons, the amount of money they paid the farmers, and the amount of money they received for sales of sweet cream. I learned that of these thirty-three creameries, twenty-eight are proprietary, owned by individuals, and the cream or milk is bought and the farmers are paid a stipulated price. The balance of them are owned and operated by the farmers, and they are paid in proportion to what they furnish. That 4,874 farmers are furnishing milk or cream to those associated creameries; that 25,515 cows contribute their products to these thirty-three creameries; and that the farmers are paid $924,389.

Now of the cheese factories, we have three with 180 patrons. Milk is furnished them from 800 cows, and $16,400 is returned to the farmers from them. Now this does not represent the associated dairy interests of our State by any means, but I had to guess at the rest of these figures. I know something about the other fifteen creameries and I think I did not guess far out of the way. I find we have 5,500 farmers in the State that are patronizing the associated creameries and cheese factories. We probably have 30,000 cows furnishing milk or cream to these creameries and factories, and the farmers are probably receiving $1,030,000 from them. These are estimates, but not far out of the way. What proportion of our farmers are patronizing associated dairies and how many are pursuing private dairying? We have 30,000 cows that are furnishing their milk to the associated creameries, and about 143,000 cows in the State, if we take the returns from the assessors. This leaves 113,000 cows whose milk is worked up in some other way than through our associated creameries. A little more than one-fifth of the cows in the State of Maine contribute their products to the associated system of dairying, and the product from a little less than four-fifths is worked up in the homes of the farmers. You know when we come together for a dairy conference we like to make it appear that it is an assemblage of creamery men and creamery operators, but we must not forget the fact that all over the State the farmers are carrying on dairies by themselves,—almost four-fifths of them are doing work by themselves. And a large part of this audience is made up of those who are doing work by themselves. Whether that is best, I cannot say; but I will say that the work of the Board of Agriculture and of our dairy teachers, is worth to those people a great deal more than to the creamery men.

A little item of interest that comes out is the sale of sweet cream. $250,000 have been received by the farmers of Maine in selling sweet cream direct, which is quite an item.

Taking these returns and making no estimates, I find that on the average $36 is received by the farmer per year for each cow. He receives for the milk and cream he furnishes, $36, not a very large average. In some of these returns $20 is put down as the average, in quite a number $25 and $30, and and in one instance $60, the average being $36. We understand that we are not doing very good work when we do not get more than $20. That system of farming cannot be very satisfactory. $25 is not very satisfactory, and $30 is not very satisfactory, because if we only get $30 as the gross income of a cow for a year it does not leave a very large margin of profit. Something is wrong. The creamery that paid all of its patrons $60 was doing very well, that was very satisfactory. A lady whom I met last night said, "My cows last year averaged 400 pounds of butter." This is one of the possibilities. What her selling price was is another question.

Now what are the reasons for all this? What are the reasons why our farmers are not receiving more money? In the first place because of the stock they have. We understand that the cows are the machines through which they are working up the products of their farms. Their hay, grain, and corn silage are carried to market through the cows, and the inferior cows of course are a part of the cause of these low returns. But there are other conditions, and what are they? Why is the product that we are sending into the Massachusetts and New York markets selling at so low a price that the returns are not more than this $20 or $30 or $36 on the average? Simply because the butter that is put into those markets has to sell at a comparatively low price. We bring a dairy expert here to judge our products, to criticise them and tell us what the defects are, even though the truth is not pleasant. He tells us our goods are lacking in quality. The color, grain and texture are all right, but they are lacking in flavor. Now what is the reason why the Maine product is running a little low? I asked Mr. Bent last night if it were a fact that Maine butter was running low. He said, "The experts talk about a Maine flavor in butter, but that is all nonsense. The trouble is that the butter we get from the creameries of Maine is uneven. Sometimes a creamery sends butter for quite a number of months and it runs well, the quality is even and we are satisfied. But all at once it drops down. This holds true with all the creameries in Maine a great deal more than in Vermont."

Last year we talked about the matter of cream separators. In Vermont, New Hampshire and Massachusetts there is hardly a dairy doing business but uses the separators. They take the new milk from the cows, and last night's and this morning's milk is run through the separator this morning, and that cream is put promptly into the hands of the creamery operator, and ripened, and the butter made from it. The creamery man gets down close to the cow and makes that butter of the new stock that has not had a chance to change in condition. We are doing business in a different way. We have but two or three creameries that use the separator. We are doing business by the gravity process. The cream has to be brought quite a number of miles before it gets into the hands of the butter-maker, and changes take place. We know that with the proper handling of the deep can process we can raise the cream on the farm, carry it to the creameries, make it up into butter, and make a grand good quality when we conform to the requirements and conditions. The difficulty is that we have so few cows, and they are distributed over our State so sparsely, that instead of collecting the cream every day it is done every other day, or every third or fourth day, and sometimes only once a week. When that stock gets into the hands of the creamery man it is in very poor condition to make high priced butter, because the ripening of that cream is going on in the farmers' cream tanks under varying conditions. The one or two hundred patrons furnish one or two hundred different qualities of cream to work from, and however expert the butter-maker may be, he cannot make the finest quality of butter out of it.

I know people say that it is of no use to present our difficulties unless some efforts are made to remove them. We can make butter, we can carry on our dairying, by this method that we are pursuing. We can raise the cream at our farms, collect it and make butter and put it into the markets and get certain returns,—that is true. But we can do better. We need not adopt the separator system and go to the expense of having skimming stations and hauling all of our milk to them. We can follow the same plan we are following, but we must do it with a good deal more care, and exercise a great deal closer supervision over the work. In the first place, we cannot make a good quality of butter so long as we pursue the present method in the way it is so largely pursued, so long as we collect cream at these infrequent periods. We must collect it every day, and get it to the creamery where it can be ripened under the best possible conditions. The objection to this is that it increases the expense. This is not valid. The cream gatherer is usually a cheap man, a man that is hired at the lowest possible price. The directors find a man that is not capable of doing very much else, and put him on to a cream route. He turns the cream out of the farmers' cans into one large can which holds the product of several patrons, and finally he hauls it to the creamery. The butter-maker takes that cream and turns it into a vat, and makes his butter from it. If the cream gatherer will only take the cream of one farm in one can, keeping each man's cream by itself, the butter-maker can tell if any lot has an off flavor, from objectionable methods of feeding or handling, or because of conditions under which it has been kept. That butter-maker, if he is an expert man, and you should employ only the best of men for butter-makers, detects at once if the cream is defective, and is able to exclude it. If the cream comes in all mixed together there is no possible way of doing this, and one man's poor work depresses the whole. This is the reason why our products are running so low. One man who is a sloven destroys the work of a hundred others who are doing good work. No matter if it does increase the expense, our products will sell for enough more in the markets to more than pay us, and then we shall be working towards a higher plane. The whole country is making butter, and we are being crowded down to closer margins and lower prices every year, and we must work to a higher plane. We have an advantage here in New England. We have the best conditions, and are close to the markets. We have an advantage, if we will only make the most of it, and with our grand dairy stock, working under the right conditions, we can put into the hands of consumers something that is so valuable that we can hold the markets we have, and secure a higher price.

There is another matter that comes in here. You know that two years ago a law was enacted that looked to the supervision of the testing of cream. We have the Babcock test for determining the value of each patron's cream, so that we may pay each man for the amount of butter fat he furnishes, and the idea was so acceptable to our operators and farmers that they have generally adopted the Babcock test. But it was thought by certain individuals that it was not being used correctly, and a law was passed requiring the operators to pass an examination and receive certificates of efficiency. Every man who used the Babcock test in paying for milk or cream was obliged to pass a certain examination. And then it was thought that the operators might be using smaller measures, and a law was passed that these measures should be graduated, and this law has been carried into effect. Forty-four of the creamery men in the State have passed examinations, and every one of those men understand how to do their work. Their glass ware has all been graduated, and they are using proper appliances. I do not know how many creameries there are in the State that are carrying on their work and employing men who have not certificates. There is no provision in the law that compels any man to look into that. But forty-four have men who are able to do the work; whether they do it or not is another question. Now how are the samples taken? The cream gatherer samples all of the cream at each farm. This cheap man who does the collecting, when he is half frozen, takes a test tube and puts it down into a can of cream and tries to get a correct sample of that lot of cream. Do you suppose a half frozen man will do it? He cannot do it if he tries. He takes the tube, which is no larger than my finger, and plumps it down into the cream and simply gets the watery milk in the bottom. If he puts the tube down slowly he gets a careful sample, but he is not apt to do this. The creamery man at his leisure, once in thirty days, does the testing. He takes that imperfect sample and applies his little graduated tube to it with all of the care he can use, to get a correct test of the sample. It is no wonder that the farmers are not satisfied with the Babcock test as a means of paying for cream. What are we going to do about it? When the cream gatherer takes each man's cream by itself, putting each lot into a separate can, and those cans are all set into a warm room, the operator, taking the samples as he ought, is able to do correct work. Under these conditions the Babcock test is all that can be expected of it, and all that is wanted of it, because it is correct when it is handled correctly.

Now this matter of private dairying. What are we going to do with that other eighty per cent. of the cows that we have in the State of Maine, that we are getting something from? What are they doing? The butter that is being put out from our associated dairies in too many instances is not of a high quality; I have tried to enumerate the causes. We have all over the State, herds of Guernseys and Jerseys, and men who are specially fitted for dairying, because they have studied the matter from first to last. They know their cows, and they know the conditions under which they can make perfect butter. They are earnest in their business because it is the business of their lives. As you go over the State you will find in almost every town one or more individuals who are doing this high quality of work. We do not get any credit for it simply because at every station you will find little packages of butter that are being sent to Boston, New York, or Philadelphia, some to individuals, and others to retailers. This butter goes to market by itself, and we get no credit for it. Some of our farmers are doing artistic work, because the conditions are right. Everything is in their hands, and they are able to do this work. They are close down to the cow. The milk as it comes from the cow is handled under perfect conditions and the butter is made under perfect conditions. A large part of this audience is made up of those farmers, and those are the ones we must seek to reach.

I want to speak of the new appliances. That is always a matter of interest. We have not made a very great advance in dairy machinery and appliances during the past year. There has been quite a change in separators, but nothing very radical. The separators on the market to-day, of all the patterns, when used under correct conditions will do perfect work. Each manufacturer will tell you that his machine does its work better than all others, but when the operator conforms to the requirements, and uses a temperature of eighty-five degrees, there is no difficulty with any of them; but when he uses a low temperature the hollow bowled machines do defective work.

You remember we are doing some work in the way of pasteurization. Appliances have been made to destroy those germs that cause the changes in the milk that butter is made from, and the creamery men are very much interested in these appliances. The pasteurizer as made at present is rather a bungling machine. It has not been perfected, although we were promised a year ago a perfect machine. All of this sweet cream, for which other states have paid us during the past year $250,000, is pasteurized. Other states have not got on to the sending of sweet cream to Massachusetts and other places as yet. We have the control of the sweet cream trade in our large cities. And we do this by handling the stock as carefully as possible, by making it very dense,—forty per cent. fat—and then by pasteurizing all of the cream. The effect of pasteurizing is to destroy the germs that cause decay and putrefaction, and the lactic acid, and it also thickens the cream very much. I have had quite a number of letters from dealers, asking what our dairymen put into the cream that made it so thick, and they have suggested whether our dairymen did not put in corn starch. They did not understand that it was simply the result of scalding the cream to 155 degrees and maintaining it there for some time, before chilling it.

One other machine I will mention,—the milking machine. You know an English firm is making a milking machine. They propose this winter to make 400 of them, and it looks as though we were getting about through milking the cow by hand. A machine has been in use two years, and it is claimed that it is doing perfect work. We shall be able to answer the question in a short time.

All over the State this dairy interest is being boomed. There is more income in it than there is in any other special or general line of agriculture, and our people are engaging in it more largely. But I believe we should not attempt to induce them to engage in that specialty to the exclusion of all others. Our first duty is to teach our people better work, get them to furnish something that is of better quality. I dislike very much to always come before you in a fault finding mood, but I do not know how else we are going to become aware of our faults unless we recognize them. We have these judges come here and tell us what we lack, and we are gradually learning that lesson. And it happens to be my office to stand up here and tell you some of your faults. We are seeking our own good, and we must try to do better work.

FROM THE HAY MOW TO THE BUTTER TUB.

By Mr. C. H. WATERHOUSE, of Windsor, Vt.

Mr. President, Ladies and Gentlemen:

There are so many things to be said about dairying that one is at a loss to know what would be the most profitable for the few minutes' talk that I may give you. I come to you from one of the best dairy regions in New England. The first dairyman in this country went from New England to Herkimer county, New York, 110 years ago, on foot with an axe upon his shoulder, built his log house, taking a Cheshire girl for his wife, and established a herd, thus beginning dairying in New York. This man's name was Arnold. He accumulated much wealth, and went to his rest honored. From this small beginning sprang the mighty giant that is now walking over the continent. American dairying now represents annually $365,000,000; that is, for butter, to say nothing about cheese. We have been told within six months that the wheat product, and wheat is the standard for agricultural products, is about 490,000,000 bushels. Each bushel does not represent a dollar, and that, even, is not all consumed in the United States. It would take a million dollars a day to supply the people of the United States with the butter they need. From these figures it will be seen that dairy farming is a most important branch of agriculture. The idea of associated dairying originated in Europe and grew out of necessity. It was the offspring of poverty rather than wealth. People would turn their cows together and employ a man to take them to the mountain regions, where a herdsman would care for them and return to each man his proportion of cheese. What distinguishes the American system is the constant effort to reduce the art to a science. Looking back over the past I can but think that we are on the threshold of agriculture, and that God wills that science and intelligence shall be the main forces to open up to us the resources of nature. It is a most hopeful sign of progress that farmers everywhere are organizing societies for the purpose of obtaining useful knowledge in their specialties, and operating together for their own interests.

In the remarks I now have to offer I hope to point out briefly some of the more important requisites for success in dairy management.

The process of cutting and curing fodder is well understood by almost every farmer. The kinds of food to be fed each day to make a balanced ration are not well enough understood. The silo has come to stay, and experience has taught and is still teaching us how to preserve silage. There are a great many ways. When silos first came into use it was thought that the ensilage must all be put in at once, but that idea has somewhat exploded. It is not necessary that this should be done. The principle is what you want, and it is the same principle that these ladies adopt in canning their fruit. I will venture the assertion that there is not one here who, in her first attempt in canning fruit, did not find that some of the bottles spoiled for the reason that she did not exactly understand the principle. If you can seal up the silo you have the secret of the whole business. The thing to do is to make it tight. We used to think that we must have a horse to tread the silage, and must put on tons of stones, brick, and sawdust to weight it. The main point in keeping silage is to let it heat to a temperature of 150 degrees. Commence to-day and put in all you can,and then if you want to go away for a day or two you can leave it. Let it stand and heat to 150 degrees. I put a man into my silo to do the treading. He attends to the corners and the edges, and the middle will take care of itself. If we adhere to the principle, and allow our silage to heat instead of putting on tons of stone and bags of sand to weight it, we shall come out all right. It is not necessary to weight it at all, if you have not the material for doing this. If you do not put on anything to weight it, and have any coarse fodder, put that on to absorb the moisture.

I think that it is possible to put in ensilage for fifty cents a ton. You think that could not be done, but I think I have done it, although I may not have reckoned quite accurately. Silage cannot be hauled a mile and put in for fifty cents, but if it is near the silo it can be put in for that.

Dairymen should study to know how to balance a ration. Do not burden your cow with a lot of food that is not necessary, but balance the ration. Have good, well ventilated stables, with plenty of light, and milk regularly. Some advise keeping the cows in continuous confinement, but I have hardly decided whether to keep my cows in the barn six months in the year, or to let them out for an hour each day for exercise. Last year I kept my cows confined in the barn. It is a new barn, with a tie-up 107 feet long, and was said by good judges to be the best barn in the county; and still the cattle commissioners of the State killed fourteen cows last March with tuberculosis. Some of you will say, "Well, he had an up-to-date barn, but he did not care for his cows very well." Three years ago my son bought a cow and brought her to the farm, and she staid there for two years; then I bought fifteen cows and put them into the barn, and she was there with that herd until last March, when she was sold to a butcher and slaughtered, and the butcher found that she was diseased. I at once mistrusted that my herd was poisoned, and sent for a commissioner, who condemned fourteen. It was not the barn that poisoned those cows, it was the cow that was there previously. Within three weeks I have had my whole herd tested again, and two of the cows, that were not tested last spring, were condemned and killed. I have running water in the tie-up, with a little cover for each cow. If she raises this up she can drink, and then it will drop back. These cows were tied up for six months, but I have not quite decided whether that is the best method or not. One thing I did notice, which was that during the six months that those cows were confined the tests of their milk did not vary any. The milk test was 5.20 for six months.

Aerate your milk in pure air. Cool to the temperature of sixty degrees, and hold it there until it arrives at the creamery. Do not haul hogs, calves or sheep at the same time, or haul the milk in a manure wagon or a dead axle wagon, or allow the driver to smoke all the way to the creamery and blow the smoke from his perfumed breath over the can. I should prefer a little fertilizer to an abundance of tobacco smoke. The separator will take out the fertilizer, although the Cooley cans will not. In the latter system all the sediment remains in the cream. Keep the flies out of the cans, and know that the cans are clean.

I denounce the too common method of forcing milk into the vats by steam jets. Butter-makers, do not use steam jets. A simple device that will heat the milk as fast as it runs into the separator, by means of tubes with hot water, is much better. I would have the best means of cooling cream to the proper temperature. The right temperature means a million dollars to the people of the State of Maine, and that is sixty degrees. Cool your milk to sixty degrees, and manipulate it at that temperature from the time it leaves the cow to the butter tub. Cool your cream to fifty-eight degrees six months in the year, sixty degrees three months, and possibly sixty-two to sixty-four degrees three months. There are reasons for all this, but we haven't time to enumerate them now. Keep the cream room at a lower temperature than the cream, as in this way the cream is not so liable to absorb impurities. It will be throwing out instead of taking in.

Churn at a temperature that requires forty to sixty minutes for the churning. I have no rule to lay down for the churning temperature. I have not in eight years warmed cream for churning. I do have to cool it a little before starting the churn. If I had cream for 900 pounds of butter I should know by experience just how much ice it would take to cool the cream two or three degrees. I would have the ice pulverized and in pails. If my churn had two covers I would have one on, and start the engine, and then as quickly as possible dash in the ice, put on the cover, and start the churn. If the ice is allowed to stand in the cream, the cream will not churn so exhaustively. If ice is put into a tank of cream and allowed to remain there one minute, a certain amount of the cream is cooled down to a very low temperature, and you would not get so exhaustive a churning. Different methods of controlling the temperature of cream are devised by proprietors of creameries. I would not use a tank for cream in which the heating or cooling must be done by hot water or ice water around the cream. In that case, the heating, or cooling, is not uniform. A part of the cream will be at too high a temperature, and a part at too low a temperature. Suppose you wish to heat by means of a steam jet? The water must be heated in some parts too hot, which would coagulate the cream in those parts, and cause specks in the butter.

I have suggested that states have a man appointed by the governor and paid $1,000 and expenses, to make a town to town canvass and put all creamery men on the right track, pull in the violations of the oleo law, etc.

Now in regard to the creamery manager. It has long been a study among creamery operators, how to get the right man to run the business, and manage the patrons as well. It is gratifying when such an one has been secured; one who can guarantee his goods to be of fine quality, and who convinces his patrons that he is dealing out justice in every particular; one who can prove to patrons that he can tell when there is any funny business in the air. Farmers, like all other men, are disposed to do as little work as possible. They seem to think that they will get just as much for their milk if it is handled in a slovenly way, with a large amount taken out for culinary purposes, as when they furnish the highest grade. The butter-maker who does not see that the separator is properly handled, and the milk run through at the right temperature,—in fact, who does not know that it does perfect work, leaving no trace of fat in the skim milk,—is doing the patrons, as well as himself, an injustice. The butter-maker who does not see that the cream is ripened to just the right acidity is doing all parties an injury. Are you, brother butter-makers, up to date in all the small details of the work? Do you always keep your dish cloths clean? If there is a germ in the dish cloth it will spoil the butter. If you take a dish cloth that has not been thoroughly cleansed and put it into a pail of water and wash out your cream tank you are liable to leave germs in the cream tank. Of course you could not hold your hands in water that would kill those germs. Keep your dish cloths clean.

The butter-maker who will favor a director or an officer is not worthy the position, but this is done in some cases. There is only one way, hew to the line.

To illustrate the importance of aerating milk, I have here one can of milk that was cooled just as it ought to be. Anybody can taste of that milk, and I will vouch for its good quality. Then I have another can, into which the milk was put directly from the cow, and the can stopped up while it was warm. You do not want to smell of it, you can take my word that it does not smell good. This aerating of milk is worth millions of dollars to the State of Maine. Not long ago I went into a man's barn for the purpose of buying some Shorthorn cows, and I discovered a milk can in the stable behind the cows, with an old door placed against it to keep the manure from spattering into the milk. Such management is not quite up to date. A man who leaves his milk in the stable would not drink a glass of water that had stood for thirty minutes in the stable. Last night I went out to a farm house, in order to get these samples of milk, and said to the man that I would like to get a quart of milk, right from the cow; and then I said, "I would like you to take a quart of fresh water, right from the fountain, and hang it up in the stable." There is not a person here who would want to taste that water; but yet farmers leave their milk in the same place and expect to make good butter. What would be the result of making butter from milk with all those germs in it? You would get butter that would pass for a day or two, but later on it would be entirely spoiled. The keeping qualities of the butter would be injured.

Ques. Is your process of aerating milk anything more than to leave it in the air?

Ans. I cool it in pure air. Just letting it stand in the air would not cool it quickly enough. Stir it thoroughly, or use any process that would cool it to a temperature of sixty degrees. I will admit that milk as drawn from the cow, at a temperature of about ninety-five degrees, would for a time, until the temperature is lowered, resist impurities. Wherein lies the injury? The covers of the cans are supposed to be opened, to allow the animal heat to escape; impure germs find their lodgment upon dust floating in the air, and finally get into the milk. Butter made from impure milk will pass for a day or two, as I remarked, but will soon deteriorate in flavor.

We are not over anxious about the keeping qualities of butter, as were commission men before the introduction of creameries and winter dairying. Consumers have become aware of the fact that butter two weeks old is not so aromatic as freshly made goods. I cater to the consumer. I have a light weight package holding twenty pounds, and one holding ten pounds. I suggest to the people in cities that two neighbors combine and have the weekly supply come in one package, and reduce the express rates per pound.

To determine what your cow is worth for butter you must milk her for about five months after calving, then milk all the milk at one time into a pail and sample it and test it. Do this for six days and average the six tests. The first milk you draw may test two per cent., and the very last is liable to test ten per cent. Perhaps this is a thing you have never thought of, but I am going to state that I am of the opinion that patrons get a higher test on Sunday than any other day in the week. That is my experience. On Sunday they are usually a little later in milking, and they are not in quite so much of a hurry, and consequently get more of the ten per cent. milk. At one time a man brought to me a sample of milk to be tested; he wanted to find out what his cow was worth. I tested the milk, and it tested twelve per cent. I said, "This is not straight milk." He said he knew it was; he took the sample himself and knew that it was all right. I asked him how he got the sample. He said, "I milked all I could get, and then I took this bottle and stripped in a little from the cow."

Of course I do not need to stop to tell you why you should milk for five or six months, you all understand that. One man will say, "I have four new milch cows, my test is too low." Another will say, "I have four or five farrow cows, and my test is too low. I have milked these cows two years and ought to have a better test." The milk from farrow cows will not test any higher after you milk them two years than when they have been milked six months.

Do not think that you can feed into a cow an increasing per cent. of fat. I do not think that you can feed into a cow an amount of fat beyond her capacity to produce. I am of the opinion that you can decrease the per cent of fat by feeding succulent food.

The temperature of milk when sampled will affect the test; undue excitement will affect the test; fatigue of the cow will affect the test; air bubbles in the pipette will affect the test. Some men stir the milk in the weigh can and then take a dipper and take some of it out, and take a sample from that. The milk has taken in air bubbles, which would affect the test. There are many ways of sampling milk or cream. The method of taking what is called a core sample is to take a little piece of pipe, insert it in the can, drop the finger on and take it out; then you have the sample. Now if milk stands for thirty seconds the top will be the best. If this pipette is lowered just as fast as the milk runs in, you have a sample all the way through it; but often the creamery man comes along in a hurry, down goes the pipette, and no milk has gone into it as it went down. I have a method of sampling milk which I will illustrate. Near the bottom of a weigh can I have a little spout coming out from the milk through which a very small stream of milk runs. By letting the milk all run out in this way and then taking a sample you will seldom find any air bubbles, and will get a good sample.

I have said nothing yet about the composite test. Suppose a man brings me ten pounds of milk to-day, and to-morrow 200 pounds. In order to take a composite sample we will take a sample of milk from the ten pounds, which is five per cent. milk, and also a sample from the 200 pounds, which is four per cent. milk. But if we take the same amount out of the 200 pounds, or four per cent. milk that we did out of the ten pounds, or five per cent. milk, we do not get the right proportions. Take the proper proportions and the composite test will do.

Another point is imperfect reading of the test. I will venture the assertion that you cannot find six men who can take six bottles of cream and read them six times alike. I am not talking about the professors; it can be done, but I am talking about those who do not do it.

Let us see how temperature affects the test. We get milk at a temperature of thirty-five and we are liable to get milk the same day at a temperature of eighty. A man just across the street may bring in some new milk. As milk is heated it expands, and there will be a difference in the test. For instance, take a sample of milk at a temperature of thirty-five and put it into a bottle, then take the same lot of milk and heat it to a temperature of 100, and take a sample. Test made: first reading, cold sample, four per cent.; hot sample, 4.20; ten minutes later, second reading of the cold sample, 4.40; second reading of the hot sample, 4.05. I do not know how to bridge over that, only in this way,—the butter globules do not expand as quickly as they should, for the reading was first four and then later 4.40, in the case of the cold sample.

Another sample of milk was cooled to thirty-five degrees, and the reading was 7.80. The same sample was heated very hot, and the second reading was eight per cent. Do not commence to read a twenty bottle test without keeping your samples hot by steam, lest the first hot sample be higher than the last, when that has contracted by being cooled.

I told you that I thought you could decrease the per cent. of fat in the milk by feed. I have made several tests, and one was recently. I suppose there is not a man in the State of Maine that has used as much sulphuric acid in testing milk as I have. The last test I made was in November. This patron's test in October was 4.55. November 10th, he brought me 188 pounds of milk, from ten cows for two days, and the next trip 257 pounds. He said, "I have got the cows into the mowing." The first test was 3.40. The next day, with 240 pounds of milk, the test was 3.70; again, with 252 pounds of milk, 4.10; with 250 pounds of milk, 4.20; with 218 pounds of milk, 4.30; and with 200 pounds of milk, 4.40. These cows were turned into a field of green oats eight inches high.

Other tests of succulent food, like sweet corn stalks, were made with similar results.

It is undoubtedly true that some creamery managers have more surplus butter than others. One man puts up twenty per cent. water butter, another thirteen per cent water. I know of one man who told me that he worked twenty-six per cent. of water into his butter. To do this he would punch a hole in the butter while on the worker, put in brine, and then tub it. The surplus butter item is all right to a certain extent. It is hard to find a butter less than ten per cent. water.

This is the result which I obtained in the months named: February, 15,316 pounds of butter by the churn, 13,670 pounds of butter fat by the test, which was 4.44. March, 16,791 pounds by the churn, 15,272 by the test; April, 15,694 pounds by the churn, 14,508 by the test; November, 15,969 by the churn, 14,565 by the test.

Ques. Do you not think that dairying increases the fertility of the farm more than other kinds of farming?

Ans. I should say it does.

Ques. Is it best to put milk into ice water just as soon as it is milked?

Ans. Certainly; the quicker the better.

Mr. McKeen—I presume that the person who asked that question had reference to the setting of milk for cream in Cooley cans. Do you think the aerating is sufficient for all practical purposes?

Mr. Waterhouse—I never have used Cooley cans, but they advocate that it is all right to strain the milk right into them. I do know that you can get more cream in twelve hours than in twenty-four. You can shove the cream up in fifty minutes in one of those cans. But you cannot do it if you put the milk in at a temperature of sixty-five, and the water is at forty-five. But if the milk is at a temperature of ninety and the water forty-five you can show the cream line in fifty minutes, and the impurities are said to be conducted out into the water.

Ques. Should the can be covered with water?

Ans. These people claim that the can must be submerged, and the impurities will go out. The little creases in the cover will allow them to pass out into the water.

Ques. Is the test of the cream the same in twelve hours as it is in twenty-four?

Ans. It would be a lower per cent., though you can get more cream in twelve hours than in twenty-four. It is quite a scheme. The cream gatherer comes every twenty-four hours, and if a man has milk enough to fill three cans, or six cans half full, at one milking, twelve hours before the cream gatherer comes he will fill his cans with warm milk and get a greater amount of spaces.

Ques. Does not the test correct that?

Ans. It does.

Ques. Is the putting of ice right into the milk a disadvantage or a damage to the product?

Ans. It is no advantage that I can see. The ice will float, and as the cold milk will settle the cream must rise and pass that. I would not advise putting it into the milk. I would sooner put in water.

Ques. What is the best method of ventilating a cow barn?

Ans. I have a barn that is 140 feet long. Right over the stanchion piece is a box, twenty-two inches square and 107 feet long. Into that box, over each cow, is a hole six inches in diameter, and there are three shafts running out from the roof twenty-two inches square, one twenty-two feet from each end, and the other in the center.

There is something funny about the system of ventilation. If you go into the cellar, and, at the place where you take out ashes, light a match and light a piece of paper, at a certain temperature outside the smoke will go into the cellar. At other times the paper will go into the chimney in an instant, the draft is upward. So if the temperature outside is warmer than it is inside the draft is liable to go downward. I built my ventilator so that at each end it goes down into the cellar. That is to take the draft downward when the tendency is downward. Some one will ask where I get the fresh air. If the barn is perfectly tight it would be a hard matter to hold that barn from the pressure outside. There is a current of air going into it all the time. I will venture the assertion that the air is as pure in my barn this minute as it is in this room.

Ques. Do your ventilators go out at the eaves of the barn or at the ridge?

Ans. They go to the ridgepole. I went to the roof of the barn because I had the opinion that the higher the shaft the greater would be the draft. I presume they are forty feet high.

Ques. What is the cause of cream failing to produce butter by a reasonable amount of churning, the temperature being sixty-two?

Ans. Because you do not keep your milk and cream warm enough.

Adjourned to 1.30 P. M.

ECONOMIC WINTER FEEDING OF MILCH COWS.

By Prof. J. B. LINDSEY of Amherst, Massachusetts.

The body of the animal is composed principally of four great groups of substances, namely, water, ash, fat, and lean meat.

Water is a large constituent of all animal matter, the new born animal having a good deal more than the mature animal. The ashy matter constitutes a considerable portion of the bone of the animal; while the lean meat and the fat are recognized as two of the most important constituents of the animal body. These four constituents, or, if you please, eliminating water, the three,—the flesh or lean meat, the fat, and the bony matter, are all made up from the food which the animal consumes. Fat, bone, and lean meat are simply, as it were, manufactured raw material, raw material converted into a higher organization. It seems therefore advisable that we should dwell for a few moments in a general way upon the composition of this raw material; upon the composition of the various kinds of plants and grains which are converted by the animal by those wonderful processes called digestion and assimilation, into flesh, bone, fat, milk and butter.

Let us take, for example, 100 pounds of hay and see of what it is composed.

TABLE I.

	100 POUNDS HAY CONTAINS.			100 POUNDS COTTON SEED MEAL CONTAINS.		
	Composition.	Per cent digestible.	Pounds digestible.	Composition.	Per cent digestible.	Pounds digestible.
Water	14.0	......	......	8 0		
Ash	5.4	......	......	6.9		
Fiber	26.7	60	16.0	6.8	......	2.2
Fat	2.4	49	1.2	10.7	93	10.0
Protein	8.1	59	4.8	41.6	88	36.6
Extract matter	43.4	59	25.4	26.0	64	16.5
	100	......	47.4	100	......	65.3

Agricultural chemists have divided all kinds of feeding stuffs, which serve as food for animals, into six groups of constituents, —water, ash, fiber, fat, protein, and so called extract or starchy matter. You will see by the table that in 100 pounds of hay there will be first, about fourteen pounds of water. Next, about 5.4 pounds of ashy material; if you take 100 pounds of hay and burn it, there will be about five and one-half pounds of ashes left. Then there are about one quarter, or 26.7 pounds, of what is called fiber, and by fiber is meant the structural part of the plant, the frame work. I might illustrate by saying that it corresponds to the frame work of a house.

Then we come to the fourth group, the fat, or oily part, and a comparatively small amount is found in 100 pounds of hay, only 2.4 pounds, and this is true of all the coarse feeds.

The next group is called protein, or, if you would allow me to express it in another way, the vegetable meat of the plant. It corresponds in a sense to the lean meat of the animal.

The sixth, or final group, is called extract or starchy matter, and there are about 43.4 pounds in 100 pounds of hay. The fiber, or frame work, and the extract, or starchy matter are grouped together and termed carbohydrates.

USES OF THE DIFFERENT GROUPS.

What are the uses of these six groups, or, if we eliminate water for the time being, of these five groups of constituents? Have they any special function as sources of nutrition, or do they all serve the same purpose? The ash, or ashes, serves to build up the bony structure of the animal. Without the ashy material no bone would be developed, and hence growth could not take place.

In the second place, what are the principal functions of the fiber and starchy matter,—the carbohydrates? First, they are the principal source of heat and energy. The temperature of the animal body is ninety-nine degrees, and it is kept there primarily by the large amount of carbohydrates, or starchy matter, that is consumed. Secondly, carbohydrates serve as the principal source of fat. The vegetable fat serves the same purpose as the carbohydrates, being a source of heat and energy, and also a source of animal fat.

Protein serves as a source of heat, just the same as the fat and the carbohydrates; but it is not the principal source. Protein is the only source of lean meat in the animal. If it were not for the protein, or vegetable meat, in the feeds which the animal consumes, there could be no lean meat developed in the animal. Protein is perhaps a source of fat, but this is at present uncertain. Protein, the only source of flesh, protein, a source of heat, and protein possibly a source of fat. Protein is also a very important consideration in milk production. It exists in the milk in the form of casein or curd. If it were not for the protein, milk could not be produced, and, other things being equal, the more protein that is fed to an animal the more milk will be obtained.

DIGESTIBILITY AND NUTRITIVE RATIOS OF FEEDS.

Now if 100 pounds of hay is fed to an animal, can all of that hay be utilized by the animal as a source of nutrition? Any food is valuable as a source of nutrition only in so far as the animal can digest and assimilate it, and in order to get some idea of the digestibility of the various kinds of feed stuffs, a great many so called digestion experiments have been made, primarily in Europe, and later in our own country. I will not attempt to describe these experiments, but will merely call your attention to the fact that in the case of hay it has been found that sixty per cent. of the fiber, forty-nine per cent. of the fat, and fifty-nine per cent. of the starchy matter are digestible. By referring to Table I it will be seen that in one column is placed the composition of the hay, in another the per cent. which is digestible, and in a third the number of pounds of that hay in 100 that are digestible. It will be noticed that 47.4, or, in round numbers fifty pounds, are digestible. Therefore when 100 pounds of average hay is fed, the animal can make use of but one-half. The other fifty pounds is of no value as a source of nutrition. They are simply the solid excrements, which, being of no further use to the animal, are thrown off as worthless material, so far as the nutritive effect is concerned. If, in case of the hay, we should take the 4.8 pounds of digestible protein on the one hand, and the fiber and starchy matter, or the carbohydrates, and the fat (converted into carbohydrates by multiplying by two and one-fourth because fat furnishes two and one-fourth times as much energy or heat as carbohydrates) on the other hand, we shall see that the proportion would be as one to 9.2; that is, there are 9.2 times as much carbohydrates in this 100 pounds of hay as there is protein. This is what we call the *nutritive ratio* of any feed or of any feed combination, merely the proportion of the protein to the carbohydrates; and in this case you will see that the amount of carbohydrates is very much the larger. This is what is called a wide nutritive ratio,—wide from the fact that there is so much more carbohydrates than protein.

In the same table you will observe the data concerning 100 pounds of cotton seed meal, and instead of there being practically five pounds, there are 36.6 pounds of digestible protein, and instead of forty-seven pounds in 100 of total digestible matter, there are 65.3 pounds, a very wide difference. The cotton seed meal differs therefore from the hay in two important particulars. In the first place, it contains a very much higher percentage of protein, and in the second place, it is very much more digestible, or available as a source of nutrition to the animal. In the case of the cotton seed meal it will be seen that the ratio of protein to carbohydrates is as one to 1.2; they almost balance each other, and such a proportion is called a very narrow nutritive ratio because the two approach each other so closely.

It will have been observed that in considering animal nutrients we are dealing with three great groups, namely the protein, fat, and carbohydrates. Having considered of what feed stuffs are composed, and the meaning of digestibility, and nutritive ratio, we are ready to inquire as to the best proportion in which to combine these various groups of digestible nutrients in order to get the best results. A great many experiments have been made, both in Europe and in our own country, to find out how much carbohydrates and how much protein ought to be fed to an animal in order to secure the best results. A large number of experiments have taught that in order to produce large and continuous milk yields, the dairy cow of 1,000 pounds live weight should have practically about two and one-half pounds of digestible protein and about thirteen and one-half pounds of digestible carbohydrates, giving a proportion of protein to carbohydrates of about one to 5.4. Now suppose an animal should be fed all the hay she would eat, how much of digestible protein and how much digestible carbohydrates would have been consumed? The animal would have eaten approximately 1.4 pounds of digestible protein and 12.2 of carbohydrates. In the first place, the cow would not have had sufficient total digestible matter; the protein and carbohydrates, amounting to but 13.6 pounds, would fall short two pounds. In the second place, instead of having 2.5 pounds the animal is only getting 1.4 pounds of digestible protein, and that is too low for an animal to produce long and continuous milk yields. The hay being a bulky and comparatively indigestible feed stuff, even should the average animal eat to the limit of her capacity, she could not secure digestible material sufficient to enable her to do her best work.

Before attempting to combine the various feed stuffs so as to secure the necessary amount and proportion of the several nutrients, let us turn our attention to the classification and consideration of the various coarse and concentrated cattle feeds.

TABLE II.

COARSE FOODS.

Low in protein. High in carbohydrates. 50 to 60 per cent digestible.	High in protein. Medium in carbohydrates. 50 to 65 per cent digestible.	Low in protein. High in carbohydrates. 85 to 95 per cent digestible.
Hays.	Brans.	Beets. Mangolds.
Corn fodder and stover.	Clover. Vetches.	Turnips.
Corn ensilage and straws.	Pea and Soy bean fodder.	Potatoes.

CONCENTRATED FOODS.

Low in protein. Very high in carbohydrates. 75 to 85 per cent digestible.	High in protein. Low to medium in carbohydrates. 75 to 90 per cent digestible.
Wheat. Rye.	Bean and pea meals.
Barley. Oats.	Gluten feeds and meals.
Corn.	Cotton seed meal.
	Linseed meal, etc.

TABLE III.

EXAMPLES OF COMPOSITION.

	Water.	Ash.	Fiber.	Fat.	Protein.	Extract.	Carbo-hydrates.	Nutritive ratio.
Hay	14	5.3	27.5	2.1	7.5	43.6	71.1	1:9.5
Clover	14	6.2	24.0	3.3	13.0	39.5	63.5	1:5.0
Mangolds	*14	7.8	6.8	.8	8.5	62.1	68.9	1:12
Corn meal	15	1.31	1.8	3.8	9.3	68.8	82.2	1:10
Chicago gluten meal	8	0.71	1.8	7.5	29.4	52.8	54.6	1:26

* Reduced to same moisture basis for sake of comparison.

Table II shows a division of the coarse feeds into three, and the concentrated feeds into two, subdivisions. In the first column have been placed the feeds low in protein, high in carbohydrates, and from fifty to sixty per cent. digestible. Under this head are classed hay, corn fodder, corn stover, corn ensilage, and straws. They are lacking in protein. For instance, in Table III you will see that hay contained 7.5 pounds of protein in 100. Anything that is below ten or eleven pounds in 100 may be termed low in protein. These feeds are high in carbohydrates, having a wide nutritive ratio, one of protein to 9.5 of carbohydrates.

In the second column I have put the foods higher in protein, medium in carbohydrates, and fifty to sixty-five per cent. digestible; the brans, clover, vetches, pea and soy bean fodders. Bran is ordinarily classed as a grain, but it has been placed here because it has only about the same digestibility as many of the coarse fodders. Taking clover as an illustration, if we look in Table III we shall find that instead of having 7.5 pounds of protein in 100 it has thirteen pounds; instead of seventy-one pounds of carbohydrates it has sixty-three pounds; and instead of having 9.5 times as much carbohydrates as protein it has about five times as much. Bear in mind that the chief difference between these two groups simply consists in the fact that the leguminous crops, clovers, etc., are higher in protein, the digestibility remaining about the same.

Now we come to the third group, low in protein, and high in carbohydrates, and eighty-five to ninety-five per cent. digestible; very much more digestible than either of the two previous groups. This column includes beets, mangolds, turnips, and potatoes. They have the same type of composition as hay and corn, being low in protein and high in carbohydrates. They differ in containing a very large amount of water, and from the fact that they are very much more digestible.

The second division includes all of the concentrated foods. Farmers generally call them grain feeds. If we should speak in a more exact way, the grains would simply be the corn, wheat, rye, barley, and oats. I have made two general subdivisions for these. Subdivision number one is low in protein and very high in carbohydrates, just the same as the first group of coarse feeds, but instead of being from fifty to sixty per cent. digestible it is from seventy-five to eighty-five per cent. The great difference between hay and corn meal is simply this, —that one is considerably more digestible than the other; and that explains the reason why when you feed corn meal to your cow in place of some hay you will get an increase in milk. There is more actual food available to the animal. Subdivision number two, instead of being low in protein is high in protein, low to medium in carbohydrates, and seventy-five to ninety per cent. digestible. This represents the bean and the pea meal, all the gluten feeds and gluten meals, cotton seed and linseed meals. The old process Chicago gluten meal, as an example, contained 29.4 pounds in 100 of protein, and if we should take the improved process Chicago meal that has been made for the last year or year and a half, instead of twenty-nine pounds there would be as high as thirty-six pounds. This group is low to medium in carbohydrates, the Chicago gluten meal containing only about fifty-five pounds in 100. The concentrated differ from the coarse feeds in two important particulars. In the first place they are all much more digestible, and in the second place many contain large amounts of protein.

Let us now take up a little in detail some of these coarse feeds, and consider their availability for milk production. First we will turn our attention to column number one under coarse feeds, of which the hays, corn fodder, corn stover, corn ensilage, and straw are examples. In the first place it is clear that the animal requires a certain amount of coarse feed, because of the construction of her digestive apparatus. The problem to be answered is, when should the farmer produce large quantities of hay, and when should he depend to a considerable extent upon other forms of coarse material or roughage? If land is naturally suited to grass, I think I should depend upon the hay crop to a considerable extent for my coarse feed. Such land should be made to produce from two to three tons of hay per acre, and it would be, in a measure at least, independent of drought.

Hay thus grown would give the farmer a cheap, coarse feed, because it could be grown and handled at a minimum expense of labor. The expense of labor is a very important item in the success or failure of all farm operations. High prices for labor, and low prices for farm products have a tendency to make the profit and loss fall on the loss side. Under such conditions hay would probably be the very cheapest crop that could be grown. But very unfortunately the larger part of our farms in Massachusetts, and I presume it holds good in Maine, are not naturally suited to grass. The land is dry and very sensitive to droughts. Such land would not average over three-fourths of a ton of hay yearly. Under such conditions it would be more economical to have recourse to the Indian corn crop. In England and in the northern part of Germany Indian corn cannot be grown because of the cool, moist summers. But in this country the climate is naturally suited to it, and therefore I consider it the most economical crop that we can raise, especially on light soils, for the production of coarse feed. Natural grass land, well manured, should produce three tons of hay to the acre, equivalent to 3,000 pounds of actual animal food. The same land similarly treated, planted to corn would probably produce 4,000 pounds of digestible matter. One would get fully one-fourth more digestible matter by raising Indian corn on such land, but the increased cost of raising and harvesting the corn makes up for the increased yield which one would obtain.

On the other hand, land which is liable to be affected seriously by drought, when planted with Indian corn would make a much larger return of digestible matter than when seeded with grass. I will venture to say that dry soils that will produce no more than 750 pounds of digestible matter in the form of hay, will yield 3,000 pounds of digestible matter per acre in the form of Indian corn.

Accepting the above statements, the next question would be how to take care of the corn, or more particularly, how to best turn it to account. If it were not necessary I would not stook, dry and husk corn, but would prefer to put it all into the silo. Very frequently this is not advisable, because we cannot feed an entire coarse ration of corn ensilage. What does the silo do for the Indian corn? Does it improve it? No, it injures it. Why is it put in, then? Simply because that is the best way of preserving it. When corn is put into the silo, in a very short time, no matter how much care is taken, fermentation takes place, the result of which is the production of a variety of acids and other products. Experiments teach that from twenty to twenty-two per cent. of the corn which is put into the silo is actually lost by waste and by decomposition. On the other hand, when corn is cut and stooked in the field and allowed to remain until November, and then husked, there is also an approximate total loss of twenty or twenty-two per cent. A great many experiments have demonstrated that the losses in the two cases are about equal. The two great advantages of the silo are these—first, that it does not cost as much to put the corn into the silo as it does to stook it and husk it and carry the grain to mill, etc.; and the second advantage is that the food is more palatable and is as a rule more fully consumed by the animal.

One point in reference to corn stover, and the reason why it would perhaps be advisable to cut and stook a portion of the crop, is the fact that we cannot feed our animals an entire coarse feed of ensilage; we must feed some dried material with it. It might be very often advantageous for farmers to sell hay and use as a coarse fodder to go with the ensilage the corn stover. An acre of corn will produce nearly two tons of dried corn stover, which is at least two-thirds as valuable, if not nearly as valuable, as two tons of the average hay. In order to utilize the stover to the greatest extent it ought to be cut, or better shredded, because if whole stalks are fed the cows will consume about two-thirds and waste the other third. You have only to notice a farmer's manure pile to judge how much value he puts upon his stover.

Again, if an animal is fed exclusively upon corn stover as a coarse feed, as good results will not be obtained, probably, as if you fed the animal exclusively upon hay. The reason for this is principally, I think, because the stover is not nearly as palatable as hay, and secondly, because the sharp edges of the stover will cut the mouth of the animal and prevent her from eating as much of it as she would of the hay. Properly fed, perhaps seven, eight, nine, or ten pounds per day, making it one-half of the coarse feed, stover returns very nearly as good results as does an equal quantity of hay. It might be advantageous sometimes to feed straws. One would not feed rye straw, because it commands such a high price in the market, but other straws can be cut and fed once a day to very good advantage.

Let us now consider the second subdivision of the coarse feeds, namely, the clovers, peas, and beans. I am a believer in this class of crops, because they are comparatively non-exhausting to the soil, in the first place, and in the second place because they furnish material which has considerably more protein than the coarse feeds of the first subdivision. Protein, you know, is the most costly material which we have to buy. It costs two and one-half or three times as much as starch. Therefore, as it is the most costly substance, we must try to produce all we can of it. Clover, and the pea and bean fodders, also, as you probably are well aware, under proper conditions can take a considerable part of their nitrogen from the air. If these leguminous plants are grown we shall have to apply comparatively little nitrogenous fertilizer. The plants take nitrogen from the air by means of certain bacteria which work together with the roots, in a sort of symbiotic action. These bacteria have lately been produced in considerable quantities, and just as there are now upon the market pure cultures of bacteria to produce a butter flavor, so pure cultures are now to be had for the purpose of helping leguminous crops take their nitrogen from the air. The material is called nitragin. Enough to put on an acre will cost probably about $1.00. It can be mixed with one barrel of water and sprinkled over the surface of the soil, thus inoculating it with the bacteria. Leguminous crops are also very valuable to raise in rotation with grasses and corn.

What now are the most economical leguminous crops? I am a believer in clover. I do not think we raise half clover enough. I should mix it with grass seed, if it is to be sown on light land. If Timothy and red top were the principal grasses, instead of using the ordinary red clover I think I should procure the Mammoth Red Clover, because the Mammoth Clover comes into blossom the last of June or the first of July, and therefore corresponds more nearly with the time of blossoming of the grasses. Not only would I raise clover in combination with grasses, but by itself. It has been raised with other crops, and has not been given half a show. If given a proper chance, and alternated with our other crops, we shall have success and secure a rich, nitrogenous food. While it is often difficult to cure clover, still it is possible to do it fairly well. Clover can also be fed green. Peas sown together with oats make an excellent green fodder. They can also be cut when in blossom and made into hay. Sow one and one-half bushels each to the acre. We have been very successful at the Experiment Station in Amherst with the Japanese Soy Bean. There are quite a number of varieties, but we prefer the *medium green* variety. I value it not to make into hay, but as a material to go into the silo with the corn. The Soy Bean will grow from three to three and one-half feet in height; it is a very foliacious crop, and will stand up perfectly. It is planted in drills, the drills being two and one-half feet apart, and the seed is sown in the same manner as Indian corn, with a corn planter. We plant about eighteen quarts of seed to an acre and have succeeded in raising, without high manuring, from nine to ten tons of green material to the acre. If sown about the 20th of May it is ready to cut the first week in September, and can be put in the silo with corn. The bean furnishes considerable more protein than the corn, and also has a tendency to sweeten sour corn ensilage. I put in from one-third to one-half beans, and one-half to two-thirds corn. It makes a very nice ensilage, and I get more milk than I do on corn ensilage alone. I have not dwelt upon the great number of fodder crops that we have experimented with, with more or less success, but at the same time have found of no practical value.

Relative to the third subdivision of the coarse feeds, namely the roots, I will simply say this,—they are a very valuable source of feed material, but they are too costly to grow. I think that can be safely set down as a correct general statement. Some of you might take exception to it, and there might be local conditions when it would be advisable for you to raise roots, but I think that, as a rule, if we are going to produce milk and butter at the prices at which we have been obliged to produce them of late, we cannot afford to depend upon roots to any extent, as a source of coarse food.

Having considered the coarse feeds, I desire to dwell briefly upon the concentrated feeds. I have already illustrated the two great differences between the coarse feeds and the concentrated feeds. In the first place, the concentrated feeds are more digestible, and in the second place, many of them contain more protein. How is one going to know the most economical kinds of concentrated feeds to buy? Suppose I am charged $12 a ton for bran, $15 for gluten feed, and $20 for cotton seed. What is the relative proportion in price between those feeds? The following table is an attempt to throw some light upon this problem.

TABLE IV.

COMPARATIVE COMMERCIAL VALUE OF THE DIFFERENT FEEDS.

	Per ton.	
Wheat bran	$18 00	$14 00
Corn, wheat, and barley meals	19 00	15 00
Oat meal	17 00	13 00
Hominy, cerealine feeds	18 00	14 00
Oat feed	16 00	12 00
Rice meal	21 00	16 00
Wheat middlings	21 00	16 00
Brewers' grains	21 00	16 00
Malt sprouts	23 00	18 00
Gluten and maize feeds	28 00	22 00
Atlas meal (feed)	28 00	22 00
O. P. linseed meals	31 00	24 00
N. P. linseed meals	32 50	25 00
Gluten meal, grade 1	35 00	27 00
Gluten meal, grade 2	31 00	24 00
Cotton seed meal	35 00	27 00

The table has absolutely nothing to do with feeding effect, it shows simply comparative commercial values. I have sketched here the principal feed stuffs which are to be found, for example, in our Massachusetts markets, and which you will find more and more upon your markets in Maine. If we take wheat bran, with a market value of $14 a ton, then corn and barley meals would be worth $15, brewers' grains, $16, etc. In other words, if wheat bran is worth $14, there is enough actual feed material in corn, wheat and barley meals for which you can afford to pay $15, in gluten and maize feeds, $22, old process linseed, $24, etc.

In the first column I have given you the commercial value of the feeds on the supposition that wheat bran is worth $18 a ton. Just now wheat bran is low, and so a second column has been reckoned on the basis of wheat bran at $14 per ton.

I think you will see the advantage of this table. Suppose I am charged $23 per ton for corn meal, and $28 for the gluten feeds. I find by the table that when gluten feeds are worth

$28 corn meal is actually worth only $19 per ton; therefore I should hesitate to buy corn meal, first because of its cost, and second because it should be my object in buying grain to obtain those with a high percentage of protein. I need such feeds rather than those low in protein, because a large proportion of the feeds grown upon the farm contain so little of this ingredient. Therefore I buy these concentrated feeds to supplement my feeds which are low in protein.

Let us now notice in Table V a more detailed classification of the concentrated feeds than we have in Table II.

TABLE V.

DIVISION I.

Class 1.	Class 2.
Cotton seed meal.	Atlas meal (feed).
Linseed meals.	Gluten and maize feeds made from corn.
Chicago, King, and Cream gluten meals.	Dry brewers' grains.
Golden and Hammond meals.	

DIVISION I.	DIVISION II.
Class 3.	Class 4.
Wheat, bran, and middlings.	Wheat, barley, corn.
Malt sprouts.	Rye, oats,
	Cerealine, hominy, and oat feeds.

In Class 1 have been placed cotton seed meal, linseed meal, Chicago, King, and Cream gluten meals, and Golden, and Hammond meals, because they are the most concentrated feeds, containing from thirty to forty per cent. of protein. Class 2 includes Atlas meal, gluten and maize feeds made from corn, and the dried brewers' grain. They have from twenty to thirty per cent. of protein. Class 3, wheat bran, middlings, and malt sprouts, contain from fifteen to twenty per cent. of protein, and Class 4, wheat, barley, corn, rye, oats, cerealine, hominy, and oat feeds, contain the least amount, namely ten to twelve per cent. of protein. The feeds in Class 4 are valuable not primarily for the protein they contain, but because they are so much more digestible than the coarse feeds.

HOW TO COMBINE THE COARSE AND CONCENTRATED FEEDS, TO PRODUCE WELL BALANCED DAILY RATIONS.

For practical purposes it is not possible to weigh out the coarse feeds, and a great deal will have to be left to the judgment of the feeder. If hay alone is fed, give all the animal will eat up clean twice daily. One-third to one-fourth of the coarse fodders can consist of straw. It is hardly economical to feed over fifteen pounds of roots daily. From thirty to thirty-five pounds of ensilage daily is sufficient. More than this will disturb the digestion of some animals, and also make many cows lose in flesh. Nine to twelve pounds of hay or other coarse feed of a similar nature, together with thirty to thirty-five pounds of ensilage, make sufficient coarse fodder for an animal's daily needs. It is not good economy to feed over one-half of any leguminous crop, either green or dry, in the total daily coarse fodder ration.

While the coarse feeds can be fed according to the feeder's judgment, observing the general rules given above, it becomes necessary both for the sake of economy and health, to weigh or carefully measure the grain ration. The coarse feed will furnish from 1.00 to 1.50 pounds of digestible protein, and we add the concentrated feeds primarily to secure the extra 1.00 to 1.50 pounds of protein necessary to properly balance the ration. The following grain mixtures will do this, and are intended to be fed in connection with coarse feeds, thus making properly balanced daily rations.

GRAIN MIXTURES FOR COWS OF 1,000 POUNDS LIVE WEIGHT.

1.	2.	3.
50 pounds Class 1.	50 pounds Class 1.	100 pounds Class 2.
100 pounds Class 2.	100 pounds Class 2.	100 pounds Atlas meal.
100 pounds Class 4.	100 pounds Class 3.	Mix and feed 5 to 7 quarts daily.
Mix and feed 5 to 7 quarts daily.	Mix and feed 7 to 9 quarts daily.	

4.	5.
100 pounds Class 1.	100 pounds Class 1.
100 pounds Class 4.	150 pounds Class 3.
Mix and feed 5 to 7 quarts daily.	Mix and feed 6 to 8 quarts daily.

The above grain rations can be used as types, and the farmer can select the particular feeds in each class which are the cheapest. In case a grain mixture is composed of three concentrated feeds, see during the winter that not more than two of the feeds have a high fat percentage, and in summer not more than one. In case two feeds only are employed in the mixture, but one of them should have a high fat percentage, especially in summer. Those feeds especially rich in fat are cotton seed meal, King and Atlas gluten meal. Excess of fat, in summer especially, is very liable to produce inflammation of udder.

The lesser amount of grain as specified above, fed together with the coarse feeds, will furnish about two pounds of digestible protein daily, and the larger amount two and one-half pounds. As the cow approaches the time of calving, the grain ration can be gradually reduced. The cow ought to go dry from forty-five to sixty days. After the animal has been dried off, from two to three or even four quarts of the grain mixture can be fed if she is thin in flesh. This amount can be fed till within a week of calving.

When to feed and water: I am of the opinion that two feedings, morning and late afternoon, are sufficient daily. The animal thus fed is abundantly able to take all that is necessary for her welfare. The cow desires considerable time to remasticate her feed, and there can surely be no advantage in the midday feeding. Feeds that are liable to taint the milk, should be fed immediately after milking.

Cows should be watered twice daily if possible, namely after the morning and evening feeding. It is a great advantage to have the chill taken from the water in winter. I would advocate the use of the self watering device whenever practicable in well ventilated barns. The animal is thus enabled to drink whenever she has the desire, which is to her advantage.

COMPOSITION OF MILK.

Average cow's milk has the following composition:

Water	87.00	per cent.
Fat	4.00	"
Casein and albumen (curd)	3.20	"
Milk sugar	5.10	"
Ash	.70	"

AVERAGE COMPOSITION OF MILK OF DIFFERENT BREEDS.

	Total solids.	Fat.	Solids not fat.
Holstein	11.8	3.2	8.6
Ayrshire	12.5	3.7	8.8
Shorthorn	12.9	3.8	9.1
Devon	13.4	4.4	9.0
Jersey	14.7	5.0	9.7
Guernsey	14.7	5.0	9.7

While the above figures can be taken as types, they do not mean that every cow of a distinct breed will give milk of the above composition. In fact a great many Jerseys produce milk with four per cent. of fat, and families and individual cows of the Holstein breed yield milk as rich as do many Jerseys or Guernseys.

EFFECT OF FEED UPON THE COMPOSITION OF MILK.

Feed has very little, if any, effect upon the quality of milk. By quality we refer to the per cent. or amount of total solid matter in the milk. It is a well recognized fact that some feeds affect the flavor of milk and possibly to a slight extent its color. Feeds rich in protein have a tendency to slightly increase the percentage of fat in case of some cows; the same can be said of feeds rich in fat. This increase is probably only temporary, however, the milk gradually coming back to its normal composition. Animals very thin in flesh, and insufficiently fed, if brought into good condition by proper feed will probably yield milk of rather better quality. The improvement in quality will not as a rule be very marked. The milk producing function is to a large extent under the control of the nervous system. Any influence that disturbs the quiet or normal condition of the animal, be it rough usage, extremes of temperature, exposure to rain, etc., will have its effect upon the quality of the milk. On the other hand, plenty of good feed increases the quantity of the milk until the animal reaches her maximum production. What has been said with regard to the influence of feed upon the quality of milk is equally true, relative to the amount of butter that can be made from a given quantity of milk. No method of feeding has as yet been discovered that so improves the quality of the milk, as to make a given quantity of milk produce more butter at one time than at another. The quality of milk varies during the different stages of lactation, but this is entirely independent of the influence of feed. The above statements are based on the teachings of carefully conducted experiments. They are contrary to the general belief that the better the animal is fed, the better the quality of the milk produced.

Ques. How does pea meal compare with gluten meal?

Ans. They might both be classed in Class 1. I think I should rather prefer the better class of gluten meals to the pea meal, although both of them are quite rich in protein.

Ques. Does it injure the value of corn fodder to pack it down while moist?

Ans. I think not, if it is not too moist, and does not mould too much. Salt can be scattered over moist fodder to good advantage.

Ques. If I have a good, rugged cow, and feed her on the combinations which you have suggested, how many years will she last?

Ans. That is the problem. I do not know, but I have some ideas about it. My impression is that when we are feeding about two and one-half pounds of protein a day and about thirteen and one-half pounds of carbohydrates, we are working the animal a little too hard. I want to find out if it is not more economical, instead of feeding two and one-half pounds of protein, to feed two pounds per day. If we should do that we should feed, for example, instead of five to seven quarts of the first grain mixture, only about five quarts; and instead of feeding seven to nine quarts per day of the second mixture we should feed only about seven quarts. In other words, we should not give the animal quite so much concentrated feed and therefore might make her last longer. I think that by feeding too much of these concentrated feeds we are wearing our animals out too quickly. On the other hand, we can go to the other extreme and let our animals rust out. There is a happy medium. If I feed my animal just a little corn meal I do not believe that I am running my machine fast enough to turn out a profitable product, but on the other hand, if I crowd too much grain into my cow I am driving my machine so fast that I am wearing it out faster than I can afford to.

Ques. Will any young stock winter on ensilage alone, without dry fodder?

Ans. They will, but I consider it very poor economy. I personally know of animals that have wintered on nothing but ensilage, but I do not think it is advisable. I think we are giving them too much sour food and too little protein. Suppose our young stock have had a good pasture during the summer and have made a fairly good growth, and we put them into the barn in the winter and feed them nothing but ensilage, which is considerably sour and has not sufficient protein, or vegetable meat, to develop their bony and muscular system; they will grow backward rather than forward, and the last state of that animal would be worse than the first.

Ques. Where can I secure these Soy beans, and how are they harvested?

Ans. I think the seed of the bean can be secured at any of the seed stores in Boston. I know that Joseph Breck & Sons keep it. In regard to the harvesting, we have not found any machine that will cut them, and are obliged to have recourse to the scythe. While that is a little slow, at the same time one man will cut a great many in a day.

Ques. Do you feed your grain once or twice a day?

Ans. I feed twice a day.

Ques. Do you water once or twice a day?

Ans. In our barn we have water before the animals all the time; but I do not think it is necessary to water more than once a day when you are feeding ensilage, because it contains quite a large amount of water. I know a great many farmers get along with feeding dry feed and watering once a day, but I think it is advantageous to water twice a day when the feed is dry.

Ques. Does it make any difference whether you feed the grain before or after the hay?

Ans. I do not think it will.

Ques. What is the effect of cotton seed and linseed on the quality of butter?

Ans. I think that the general opinion is that the cotton seed meal produces rather a hard, and the linseed meal a soft butter.

Ques. Is it well to feed grain in the straw?

Ans. I do not believe in feeding a cow any grain whole, because there is a sort of a covering over the grain, and the animal will not chew it a great deal, and consequently a considerable of it remains enveloped in this covering, and is of no value to the animal.

Ques. Does it pay to warm water for cows in winter?

Ans. I think it does, if it does not cost us too much. There are many times when we are so situated that we can get a little heat, and take the chill off of the water, and this is a great advantage. I believe if we give water which is luke warm to our cows in winter we shall get a profitable return in the milk pail.

Ques. Would you feed a cow all the salt she will eat?

Ans. I would. I do not think there is any danger of an animal eating too much salt. She will eat what is necessary, and there is no danger from it.

Ques. Does feed flour contain more or less protein than wheat middlings?

Ans. I think rather less.

Ques. What do you think of a mixture of one quart cotton seed meal, one quart corn meal, and one quart shorts, with all the hay the cow will eat, twice a day?

Ans. I think that would be a very good mixture indeed; and about as much as we can afford to feed to our animals. In other words, if we fed very much more in the course of a day we would be working our animals a little too hard.

Ques. Wouldn't it be better to cut down on the hay and increase the shorts, now that the hay is selling comparatively high and bran low?

Ans. It would. I intended to make a point of that. I consider bran, or shorts if you please, a better feed for milk production than hay. If I can buy shorts at twelve or thirteen dollars a ton, and can sell my hay for fifteen dollars a ton, as we can do in Massachusetts, it is unquestionably to my advantage to sell hay and buy shorts.

Ques. What is the comparative value of ensilage and straw?

Ans. The ensilage is twice as valuable as the straw. There is twice as much digestible matter in the ensilage.

Ques. Would it improve straw to cut it up and mix it with meal?

Ans. If the straw is cut up in this way the animal will sometimes eat more of it, but cutting it up and mixing it with meal would not increase its nutritive effect a particle.

Ques. Why do you feed grain before you do hay?

Ans. I have only one reason, and that is that I want the cow to eat the grain anyway; then after she has eaten the grain and I know where that is, I want her to eat the ensilage; then she has so much appetite left, and I am not afraid to give her all the hay she will eat. But if I should reverse it, I should be afraid to give her all the grain she would eat. It is very safe to feed an animal all the coarse feed she will eat, but we have to measure the grain, so I like to get the grain out of the way first.

Ques. What is the relative value of corn meal and gluten meal? If I can buy corn meal for $13 a ton and gluten meal for $18, which would be preferable?

Ans. The gluten meal, because when I feed corn meal and hay I am feeding an improperly balanced ration,—my ration has not sufficient protein in it; and therefore I can very much better afford to buy gluten meal, containing so much more protein, than the corn meal. I think if corn meal is worth $15, gluten will be worth as high as $24, for milk production. Gluten meal is the corn with the larger part of the carbohydrates taken out, and therefore the proportion of protein is much increased.

Ques. If the grain is fed before the hay will not the hay crowd it out of the stomach before it is properly digested?

Ans. There will be no trouble about that. The process of digestion is slow, it will be four or five days before the cow gets through with the grain. If you should cut down your feed one-half or increase it one-half you would not get the full effect of this change for perhaps ten days, although you might possibly begin to notice a difference in twenty-four hours.

THOROUGHBRED HEREFORDS, PROPERTY OF MR. C. O. DILL OF PHILLIPS.

DAIRY EXPERIENCE MEETING.

WEDNESDAY EVENING.

MR. GEORGE FLINT—Ladies and Gentlemen: It is necessary that some one of us shall open this discussion, and, I presume as a matter of form, that was left with me. One can but be impressed, by viewing the machinery and the dairy appliances exhibited here, with the fact that times have changed very much in a short life-time. A gentleman remarked here this afternoon that for the last three years he had seen changes that he never expected to see, in dairy products and appliances. Fifty years ago a cow, a tin pan, and a dash churn were all the requirements for dairying. The requirements now are very much different. We have called in artisans and architects, we have consulted the chemist, in fact, the chemist is beginning to have more to do with this business than almost any other profession. If we would comply with all the conditions that are considered absolutely necessary in order to meet the requirements of the trade, the demands of the business, we are obliged to listen to those who have made it a specialty, because every branch of it, commencing with the production of the feed for the cow, has been reduced to a science. They tell us that we must produce these feeds under favorable conditions for economy, and there we call in the chemist, because the constituents of the foods, and their feeding values, differ so much.

Then, in regard to the milk, comes in the importance of cleanliness, the method of separating the cream, of obtaining the butter from the cream, temperature, salting, and so many various questions that the specialist has studied that I shall leave the subject for him, feeling that I shall trespass upon his grounds, and shall take the time which might be more profitably used.

MR. C. E. WHEELER—Mr. President, Ladies and Gentlemen: I am hardly prepared to say anything this evening because I supposed that older members than myself would quickly follow Mr. Flint, and I expected him to take up more time than he did. But there are some things, perhaps, which we ought to consider. This, as I understand it, is sort of an experience meeting, and we have all had experiences in one way or another in the management of our dairy cows. I think that I have had some that have been worth to me something, and, while I am not going to detain you long, there is one thing that I want to speak about, and that is in regard to the way we raise our cream, as is generally done in this State, with the Cooley system. We have a farm two miles from the village, and we have to get our ice supply a mile farther on. It has been a severe tax to us to procure ice enough to last us through the summer season. It may be the same with many of you. It was a severe tax last year, especially, and we put in a very small supply. I felt that something must be done. I began to look about me, and on that farm there was an extra good spring but a few rods from the buildings. We tapped the spring with a half-inch pipe, and ran the water down to a small building which was erected, and there placed a tank. The water ran through that half inch pipe all summer, and not one pound of ice has been used. The cream collector has repeatedly said that he found the sweetest and best cream in that tank of any on the route. Now have not some of you a spring that you can utilize, thereby saving a severe tax? It is in this way that we must help ourselves, if we can, for in order to produce our cream at the most economical rate we must cut down the expense as much as possible.

Ques. What is the temperature of your spring?

Ans. You remember that in August there came some very warm days. Previous to that the thermometer had registered forty-seven, at that time it registered forty-six. We also found that the temperature of the water in the tank in the early spring, when the surface water was running in, was forty-six. The three degrees, forty-six, forty-seven and forty-eight, are the only ones that we have ever found, and a thermometer hangs in the tank all the time.

MR. OTIS MEADER—Mr. President, Ladies and Gentlemen: I have had some experience in dairying, but I am not much of an impromptu speaker. I have a better command of my ideas in writing than I have in speaking. However, I have been much interested in the talk that we have heard here during this meeting, and I think that we can go away from here with new ideas. It has been remarked that there have been many changes in the dairy business during the last few years. There have been more changes, probably, in this branch of farm operations than in any other branch. It has become reduced to a science. It is now found necessary to have something of an education in that line. In years past the farmer kept a few cows and the good housewife did the dairy business, whatever was done. At the present time those conditions are changed. The requirements of the trade have changed to such an extent that such butter as was made at that time would not stand much of a sight in the market to-day.

The feed question we have heard spoken of to-day, and it is one of the most important questions arising in the dairy business. The time has come when the cost of production of an article is one of the principal things to be looked upon, and in order to keep that where it should be, and have the product made at a paying price, the feed question must be considered carefully. And to that end the person who is engaged in the dairy business has got something to learn. We can all learn, no one is so far advanced but that there is need of study and thought upon the subject.

The question of manipulating the product is a very important one, as we can learn by studying the samples which are here to-day, and the score that they have received. I think it is hardly possible to give any new ideas, or touch any subject that has not already been spoken of, and I beg to be excused from any further remarks.

Mr. Eli Jepson—My experience is somewhat limited in this business. It has only been about four years since I first knew anything about it, and I have just begun to learn that I do not know anything about it now. I think it will take me at least twenty-four years more to learn it all. There is a good deal to it when you come to look into it, more than I supposed there was when I began. The study of milk, cream and butter I consider of a good deal of importance. We are trying to make some good butter, but we think we fail somewhat from the fact that the farmers do not work with us as we wish they would, and keep their cream and milk in as good condition as it can be kept. That we consider the main thing, and if the farmers would all try to improve in that direction I think we could make better butter hereafter than we are making now. We are trying in all the ways we can to make it good. We have three little factories, one at Winthrop, one at Monmouth, and one at Livermore Falls. At the three we make something like a ton of butter a day, now. In June we made over thirty tons. We print the largest part of it into prints such as you have seen here to-day. We send it about all to Lynn, and find a market for it there.

Ques. Do you find any trouble in competing with the dairymen in other places?

Ans. We have lots of competition at both ends of the line, but we try to keep up our end as well as we can. We are trying to bring the Maine butter up to anything that is made, and if the farmers would work with us I think we could do it in time.

PROF. CHAS. D. WOODS—A young man who was a little bit foppish in his dress and a little bit soft in his ideas was talking to a young lady, and he said, "Miss Mary, do you think I had better be an artist or a poet?" "An artist by all means!" "Oh! then you have seen some of my pictures." "No, but I have read some of your poetry." Now perhaps you will think, after I have tried to talk to you a moment or two, that it will be a great deal better for me to stay over in Orono, than to come here and try to talk.

There are two or three things—I have more convictions than that, but there are a few things that I am decidedly convinced about, and one is that there is no business in this world in which men are engaged that requires so much of natural common sense, together with all the knowledge which men can gather, as this one profession of agriculture. Now that sounds a little bit high toned, possibly, because we have gotten into the habit of thinking of agriculture as a business which any man can pursue. Really and truly I believe that you can take almost any young man and send him to college and make of him a tolerably good physician, a passable lawyer, a fairly successful minister, but I believe that if you are going to take a man that shall be a successful agriculturist you have got to take the brightest boy that comes from the farm or out of the city, and give him the very best education that he possibly can get; then he will make a successful agriculturist.

We have heard it said until we have almost come to believe it that farming is a poor business. There are lots and lots of men that have been saying it, though I have not heard it so much recently. I have but a short time ago come up from Connecticut, and when the hard times struck us two years ago that idea began to drop out, and every farmer was sort of hugging himself that he was a farmer. And yet we have heard it for so many years that we have almost come to believe it. But the fact is that farming is a good business, but there are lots of poor farmers, because they do not know their business. We are not going to turn this thing the other side up in a moment. We are not going to get the brightest and the best of the young men into farming at once, neither are the men who are in agriculture going to turn themselves to something else and make way for the young men who are brighter and smarter. We are too old, and have been working along the lines of the farm too long to enable us to go into some other business. But this fact is true, that if we are going to be successful farmers we have got to be brighter farmers than we have been in the past. We are never going to get as high prices for our products as we have in the past, and the only chance to make a profit is to reduce the cost of production. I do not believe that there is any other occupation in this world in which one quarter of the men who are engaged in farming could make the living that they are making on the farm. We sometimes think that the farmer is hard worked. He *is* hard worked, he does altogether too much muscle work. I want to call your attention to one thing. I can hire, anywhere in this New England, men to work for from $1.25 to $1.50 a day that have got just as much muscle as there is in this big body of mine. There is no trouble about that, but all I hire is their muscle. Now if you or I go upon the farm and are doing muscle work and nothing else, what should our pay be? Of course not more than this $1.25 or $1.50 per day. But I hear many farmers say, if I could earn $1.25 or $1.50 a day I should think I was doing pretty well. Remember that it costs the artisans in our cities about $400 per year to live;

that is, about \$1.25 to \$1.50 per day. The farmer gets his living and brings up his children, and he is earning all that the ordinary artisan is earning. We cannot expect muscle to pay one cent more on the farm than it is worth anywhere else in the market. Things will cost and bring exactly what they are worth in the market.

Now how are we going to get more money out of the farm? There is only one way to do it, and that is to commence to put more brain work into it. An ounce of brain is worth more than a ton of muscle in the world's market, and the moment you commence to put brain work into farming, that moment you commence to put in something from which you should get more than the \$1.25 or \$1.50 per day. We must make our farming a business, and one of the reasons, in my opinion, that the dairy farmer is more successful than the farmer in almost any other line is that he has been compelled in these last days and years to put his calling more upon a business basis. Our attention has been called to-night to the fact that advances are being made all the time in this one business of dairying, and that there are things in use to-day that were undreamed of three, five, and ten years ago. And it is just because of that, and just because the man who is trying to keep up with the procession must hustle a little, commence to count the cost, in other words put in brain work, that he is making the dairy farm pay better than the other farm. There are other reasons, but I will not speak of them now.

I believe that dairying has a great future in this State. In other words, I believe that there is no business in this State along farming lines which offers the opportunity that the dairy industry does. Let us stop for a moment and think. Butter, to-day, is worth in the world's market anywhere from ten cents to one dollar a pound. Not much butter is selling for a dollar a pound, and since we have been blessed with oleo, or because we have been blessed with it, ten cent butter has been crowded out. Oleo is a curse, but it has done one thing—it has driven absolutely poor butter out of the market. We are making a butter which is bringing fifteen cents, and we are working toward a butter which has a quality so that the man who appreciates the very best and is able to pay a fancy price will wish to purchase it. A good deal of butter is being sold as high as fifty cents a pound, so that there is an incentive for every man to bring his butter up to twenty-five or fifty cents.

Another thing—there are ordinary cows, that are not of fancy pedigree or anything of the kind, that are producing as high as 300 or 350 pounds of butter a year. I knew of one herd in Connecticut, of twenty cows, from which the owner was selling on the average, 350 pounds of butter per animal per year. These were not phenomenal cows, they did not have noted ancestry, and they did not have phenomenal feed. They were not fed by a phenomenal feeder, but they were fed by a good farmer, a good dairyman, who was watching his cows and had culled out the unprofitable ones; and these cows did not cost him more than \$35 or \$40 an animal.

I know comparatively little about the cows in Maine, but I am willing to wager anything that there are more 150 pound than 350 pound cows in the State. If a man has a 150 pound cow he has all the incentive to work towards a 200, 250, 300 or even a 350 or possibly 400 pound cow. Now in what other business is there anything like this? Do you suppose that if any of the manufacturers here upon this river saw any chance whereby they could double the outgo of their factories they would not jump at it at once?

This afternoon one man said to me, "That talk is all right, and I suppose that you men understand it, but we do not." My reply was, "I am sorry, it is hard work to learn to understand those things, but if you are going to be a successful feeder you must learn to understand the fundamental laws which underlie feeding." Let us take an instance. We have a cow and we have been feeding this cow without very much thought about it, but we find that we can put some more feed into her and get better results. Do you suppose that if these manufacturers here were not blessed with this water-power and were trying to burn coal to get their power, and one of them found that if he used a half ton more coal to-day he would get more work out of the factory than that \$2.50 worth of coal cost him, he would not to-morrow put on another half ton above that, and so on. Do you suppose he would stop to say, "That is a pretty tough one on the old chimney, running so much heat and smoke up there, perhaps the chimney will burn out quicker." He would not stop to consider that, but he would consider how much he was getting out of his factory. This factory man would not try to overburden his boilers, but he would, up to the limit, keep crowding in fuel, if he was getting extra dollars thereby.

We want to watch our animals carefully, and if we find that they are doing fairly well let us try giving them a little better feed, and watch them. If they respond, and we get better results, let us give them a little more. We shall come to the point by and by where we have reached the maximum capacity of the cows, and all the food that is given above that is wasted. But I believe that we want to feed up to the point of maximum production. We are not so much interested in the question as to whether the cow will last six years or seven years or ten years, as we are interested in getting the maximum product to-day and to-morrow. We want to look after her health, and see that we are not breaking down the animal prematurely, but we do not want to be so conservative as to be afraid that if we get an extra quart of milk we are taking a year out of her life. A cow is not so easily wrecked, if we are watching her, and feeding judiciously.

I believe that we are going to make a success of this business of dairying. We are going to bring it down to the strictest of business principles. I am willing to risk the statement that there are not more than five men present who can tell me exactly how many pounds of milk any cow in their herd has given them in a year, and exactly how much butter fat, and approximately how many pounds of hay or grain they have had to purchase. If in any of these factories, the owner could not tell you to one cent the cost of every material which comes in, just how many pounds of steel are used and just exactly what it costs, and exactly how many pounds of steel it takes to turn out a dozen or a gross of hatchets, that man is not doing his business on the same principles on which manufacturers are doing their business elsewhere. In my opinion, if we, as farmers, are going to make this business exactly what it ought to be, we must get it right down to the same plane on which any other business man does his business. The man who is manufacturing milk is a manufacturer just as truly as the man who is manufacturing woolen cloth. We want to get right down to that business basis. If you will hang in your stable a dial scale, with an adjustable hand, so that you can set it at zero, and hang a pail upon it, you will find that it is the simplest thing in the world, after you have milked one cow, to pour the milk into that pail, and see how far the dial goes down, and write down the exact amount. Do the same thing to-morrow, the day after, and right along for the number of days that the cow gives milk. Some of you, with some of the cows that you are feeding, will not be bothered to do that more than 200 days in the year; but you ought to be bothered to do it over 300 days. That will tell you exactly how many pounds of milk that cow is giving you in a year. Then with the Babcock test you will find exactly how many pounds of butter fat the milk contains. It seems as if those things were too difficult for us, too much bother, but we must know the cost of production to cheapen the cost of production. We want to know exactly where we are.

I believe if a man is going to be a successful agriculturist he must take all the brains God has endowed him with, and add all he can of what man has discovered, and use all he can of it for agriculture. We are using every day the most profound sciences, we are putting them into practical application, and if we would be successful agriculturists, we must be more or less familiar, and the more familiar we can be the better, with those sciences which underlie our art.

MR. McEDWARDS—The main point in dairying, in my opinion, is the process of getting the cream, or fat, from the milk. We find that the greatest difficulty in the manufacture of fancy butter is that we do not get a fancy article from which to make the fancy butter, especially in Maine, where we receive the cream from the farmers. We have to take it just as they bring it to us. The cream that comes to us in good shape we can control to a certain extent by the use of proper starters. What I want to impress upon the minds of the farmers who are present is the necessity of giving us a pure article. I do not want to run down any particular mode of separating the fat, as long as we get it pure. Of course you all know that milk from a cow that is healthy is perfectly pure, and if kept away from the air would keep indefinitely. They tell us that the souring of the milk is caused by outside germs, particles of dust in the stable, dirt from the clothes of the milker, or from the udder of the cow, which enters into the milk and causes fermentation.

I think that if the farmers of this country would use the separator we should be able to get the cream in a better condition. I mention the separator, because with that you can take out whatever dirt gets into the milk. If the milk is well taken care of and clean, the Cooley is a nice system. But we find that with the experience we have had with over 500 patrons, the average system, outside of the separator, is not perfect, either in producing clean flavored cream or in getting all the fat. Of course if the Cooley system is used as it ought to be it will take out nearly all of the fat. But I find samples of skim milk from over fifty patrons which will test about eight-tenths of one per cent., while samples from the separator hardly ever go above two-tenths of one per cent., even with the farmer handling the separator. I am not an agent for separators, but I would advocate them for all farmers who are sending cream to a factory or making butter at home.

DEMANDS OF THE BUTTER MARKET.

By J. HARVEY WHITE, of Boston.

Mr. President, Ladies and Gentlemen: To-night I received rather a melancholy letter from a friend of mine at home. He asked me to learn who had charge of the cemetery in Skowhegan. After assisting the judge in scoring your butter to-day and inflicting a speech upon you to-night, I think I will have more personal inquiries to make as to where that man is to be found.

I will try to be brief and not undertake to tell you a great many more things than are absolutely necessary that I do not know. I cannot tell you about making butter because I never made a pound, and never owned a cow, and have had nothing to do with the dairy business except in trying to squirt such milk into the pail as I did not upon myself, at one time when trying to milk a cow.

The President has inquired of Mr. Jepson about the competition of Maine butter with that from other sections, and perhaps I could say a word about that. It is not the fault of the cows, it is not the fault of your feeding, it is not the fault of the cream, it is not the fault of your land, that Maine butter is quoted lower than butter from some more favored sections. The main cause, in my estimation—and I think it would be borne out by the other gentlemen from Boston who may be here—is in the system which you from necessity at the present time have adopted. In the open markets separator butter outsells gathered cream butter, partly by virtue of its excellence, and partly on account of the prejudice of the people. Take two packages of butter between which there is absolutely no perceptible difference, and tell a buyer as we meet him in the market that one is made from gathered cream and the other from separator cream, and he will choose the separator butter unless you make a concession in the price. That may not be just, it may not be common sense, but it is a fact, and I am here more to state facts than anything else.

If you can only increase the size of your herds and the butter producing capacity of the cows that you have, enough so that, within easy distance of a creamery—and by that I mean within five or six miles—milk enough can be collected each day, separated, and ripened in due process and churned, to make the churning worth while, then I think you would be prepared for the separator system, and I do not believe there is a state in the Union that would beat you on the quality of butter. But until you can successfully manufacture your butter by the separator process, in your creameries, I fear that it will have to be sold under the comparative odium of gathered cream butter. I do not, by making that statement, mean to say that I consider that butter made from gathered cream—I mean from cream raised by the gravity process—is necessarily poorer than butter made from separator cream; but the conditions under which a butter-maker in a factory has to manufacture butter from the large amount of cream that comes to him from different people, give the advantage so strongly to the separator, that the man who is using this has an enormous advantage over the man who has to take cream from various people in varying degrees of ripeness, some perfectly sweet, some all ready to be churned, and mix it all together until it shall come to an average degree of ripeness, and then put it into the churn and churn it. Half of it is not sufficiently ripe, and the other half is too ripe to make the best butter.

Now there are two or three points that I wish to mention, in regard to the market demands. Of course the most important thing is flavor. The experts here have told you how to produce the best results by process of manufacture. I wish to emphasize the point of feed. Do not feed to your cows to too great an extent the articles of food that produce an odor, or a flavor in the butter, if it is other than what we would call perfect cream flavor. For instance, do not overfeed ensilage. Ensilage is a splendid feed, but you can feed so much that you put an improper flavor into the butter. Cotton seed meal makes splendid, hard, waxy butter, and is a most excellent feed, but if too much of it is fed it will flavor your butter. Avoid feeding to excess the kinds of feed that will give your butter a flavor.

Another point, avoid odors in your barn. Do not, when your cattle are in the barn, cause them to breathe in foul and noxious odors. An illustration of how important that is occurred a year or two ago in the case of a creamery in Vermont that was shipping to us, which used this gathered cream system, the same as you have. For three successive weeks the butter came in with a disagreeable, bad flavor. We examined it to the best of our ability and could not find anything to indicate that the difficulty was in the making of the butter, or in the ripening of the cream. And we concluded that it was not in the feeding. We wrote the creamery man, "You are getting some bad cream somewhere, and we cannot tell you what it is, but watch your cream." He did so and he found that two of the farmers—this being the spring of the year—had just put into their barns quite a large amount of phosphates and fertilizers that produced a strong odor in the barn, and the cattle were standing and inhaling it. The very next churning after he cut out those two dairies, the butter was all right. That shows you what can be breathed into the system of the cow and transmitted into the flavor of the butter.

Another point, if you have any odors in the barn they are liable to get into the milk. It might be that the odor from these barns to which I have referred got into the milk rather by process of germs going directly into the milk than through the cow.

Another thing of great importance that affects the flavor of butter, and is of greater consequence, I believe, than farmers and creamery men may realize, is the salt which you use. Salt chemically is sodium chloride. The nearer which you can approach to chemically pure sodium chloride the nearer do you come to the quality of salt which should be used in the manufacture of butter. There are excellent salts made in this country, and I would recommend to you the United States salts in preference to European salts, because even though both should be of equal excellence when manufactured, the European salts, coming over in the hold of the steamer, where all sorts of things are put into the cargo, will absorb odors which will work into your butter.

The second point in regard to salt is to have it of sufficiently small grain so that it will be readily absorbed and not taste gritty upon the teeth when the consumer puts it into his mouth, if it reaches him in the course of two or three days. Further than that, fine salt does not mangle the granules in the butter as coarse salt will.

The package in which the butter is to be placed is important. In relation to tubs I would simply say, have good, strong cooperage, keep clean if you possibly can, and ship over the Maine Central Railroad. There are some creameries out West that have so long a distance to ship that they guard especially against injury to the tub, and cover the outside with coarse, brown paper in order that the tubs may arrive with the cooperage absolutely perfect. I offered a man last summer a cent a pound more for one particular lot of butter than another simply because it looked so nice on the outside, and I knew that I could sell it to the particular trade. Boxes should be strong, contain full weight, and be securely crated. There are two kinds of boxes which are commonly sold upon the market, the round, five-pound box with which you are familiar, and the somewhat newer oblong shape, a sample of which you will find in the hall. This is beginning to supplant the other, and I will recommend to your consideration some of the various makes of oblong boxes that are put upon the market. I claim for them two points of excellence, both of which please the consumer and are legitimate demands of the market. One is that the butter is surrounded with parchment paper on all sides, and thereby protected from the wood, and comparatively free from the obnoxious woody flavor that one gets when butter has stood in a wooden package.

The second is the more aesthetic point that it can be turned out in good shape, and a nice slice put upon the table, whereas to get a piece of butter out of a five-pound box in which the butter has not shrunk away from the package, it is necessary to dig it out with a knife and place an unsightly piece of butter on the table. Print butter, of course, should be shipped in trunks, and the trunks should be thoroughly steamed with live steam at the creamery, and if the farmer is blessed with live steam at his farm every package in which butter is shipped should be thoroughly steamed. This, to a large extent, deodorizes the wood, and the butter is less liable to take a woody flavor. A half pound print, divided across once, into quarters, is more largely in demand on the Boston market than any other style of print, and it is best packed and shipped upon trays rather than placed in a package solidly. This is particularly necessary in summer, when it is liable to melt and become damaged.

Another point which I would mention—and you may smile at it, but it is no smiling matter to the person who has to take off from the team and load upon the team a large amount of butter and run the risk of this defect—is the fastener with which you put the cover upon your tub. I think there is no greater temptation to profanity in our market business than when a man is unloading a load of tubs that are fastened together with these wire fasteners that are very brittle and break off and tear the hands all to pieces. And aside from that they stain the tub very quickly as soon as it becomes moist, and make long, dark streaks, making the tub look like an old tub. The best fastener, the one which all the commission houses of Boston have united in recommending, is a tin fastener made by Bradish & Son of Boston. All the agents in Maine have them. It is a fastener which can be fastened upon the tub as quickly as any others.

Let me give you a caution, which is not so much needed in Maine as it is in the West, and that is to keep foreign substances out of your butter. That may sound unnecessary, but if you could only see the great quantities of flies that we sometimes get in tubs of butter I think you would be astonished. They would put a good housekeeper to blush on a currant cake every time. I have found in butter, flies, hairs, rags, sticks of wood; but the worst thing I got this fall was a dead rat.

It is absolutely necessary in ripening your cream in a creamery that you should keep it away from any odor, either of the barn silo, or—I was going to say the skim milk tank, but you do not have them here. Any odor which you get into the cream is absorbed by it, and so gets into the butter.

Another essential is to wash your butter thoroughly, and get all of the buttermilk out; because we have to work so hard to get rid of butter that contains a large amount of buttermilk, this white, cheesy buttermilk, that is known to the trade to be the worse thing to get in butter that is to be kept, because it is already in a state of partial decomposition, and makes the butter strong, very, very quickly. Therefore get the buttermilk out at all hazards, by a process of washing, and not of working until you have jammed the grain all to pieces.

I mentioned a moment ago the Maine Central Railroad. Now here is a matter which I want this association to take hold of. From at least two different points through the past summer, and on more than a dozen occasions, we have had butter shipped to us from this State in refrigerator cars in which meats, or something of that sort have been stored, and the tubs were all covered with blood. You can imagine how appetizing it would be to show a man a package of butter all smeared over with blood. I wish that you as an association, through your officers, might go to the railroad officials and see if you cannot secure a proper refrigerator service for butter that is shipped to Boston, or anywhere else, because it cost those creameries a cent a pound to have the tubs in that condition, although we got it out of the railroad for them, and so Maine lost nothing.

If I were to say, in closing, the one thing that I always feel like urging upon farmers beyond everything else, it would be upon a line along which a distinguished professor has been talking to you—building up the quality of your herds. Now as business men, looking at the proposition simply from the dollars and cents standpoint, I want you to think of just these figures. Let me ask you how much it would cost to feed a cow a year in the way she should be fed.

Ans. About $42.

For the sake of rough calculation we will call it $40. I have in mind the president of one of our creameries in Vermont, who has a herd that averages over 400 pounds of butter per head each year. If it costs that man $40 a year to feed his cows, it costs him just ten cents a pound to produce his butter. That is easy to understand, is it not? Has there been a time this year when it has not been profitable to produce butter at ten cents a pound?

Take another case, of a man who has a herd that averages 300 pounds, which it costs him $40 a head to feed, and it costs him 13 1-2 cents a pound to produce his butter. Isn't there a profit at that price?

The man with a herd of 200 pounds it costs twenty cents a pound to produce the butter. When you get beyond the

200 pound cow you have got to figure a profit above an average return of twenty cents a pound for your butter. Now do not for a moment think that you can make your farm pay you a profit unless you have good machinery. The machinery for diarying is your cow, and you must remember that a poor cow is a most expensive machine, which most farmers are not sufficiently rich to maintain.

Ques. How do you account for the fact that your customers prefer butter made from the separator to that made from gathered cream?

Ans. Just on the ground that ordinarily the butter that is made under the separator process is superior to that usually made under the gathered cream process, and therefore they have a prejudice in favor of the separator system. It is not sufficiently founded upon fact—I do not justify that position except to the extent that the conditions for making first class butter are easier and more certain under the separator system when applied to a creamery.

Ques. Don't they have the idea that butter from the separator is really neater?

Ans. They do, but that is not the whole reason of their preference. The separator system is supposed to produce better butter, and ordinarily does produce better butter than the gathered cream process.

Ques. Would the same theory apply to butter manufactured upon the farm, where the farmer has entire control of his milk and cream from the time it leaves the cow until he puts it into the package for shipment?

Ans. It would to some extent, but not to the same extent, because the conditions for making butter under the raised cream process upon the farm are vastly better than for making butter under the same process in a creamery. But there is, nevertheless, a prejudice in favor of the separator. I notice that people in Maine have a prejudice against voting for any man that has not the label Republican to his name. It may not always be that that man is superior to the other man who is a candidate against him, but the reputation and the label elect the candidate. And it works in much the same way with separator and gathered cream butter on the open market.

Ques. Does the Boston market require print butter to be wrapped?

Ans. Yes, sir. If it is to be sold on the open market print butter should be wrapped. If you have some special trade, suit that trade. If you are making butter for particular customers make it just as they want it. If they want it green, make it green; if they want it salted with saltpetre, make it that way. Give them just what they want and will pay for. But for the purposes of the general market print butter should be wrapped, and the demand is more general for the half-pound print marked into quarters.

Ques. Will Maine butter, under the same conditions, bring as much as Vermont butter?

Ans. If you do not tell the customer where it comes from, it will.

Ques. I would like to know what your own opinion would be in regard to the two systems of separating cream, regardless of the prejudice in favor of the separator.

Ans. If I were to run a creamery I should certainly place a separator in it before I put in even a steam engine. If I were to run a private dairy I should probably put in a separator, but when it comes to the farm I cannot speak with authority. I know what the trade will pay for, and that is separator butter, especially from creameries.

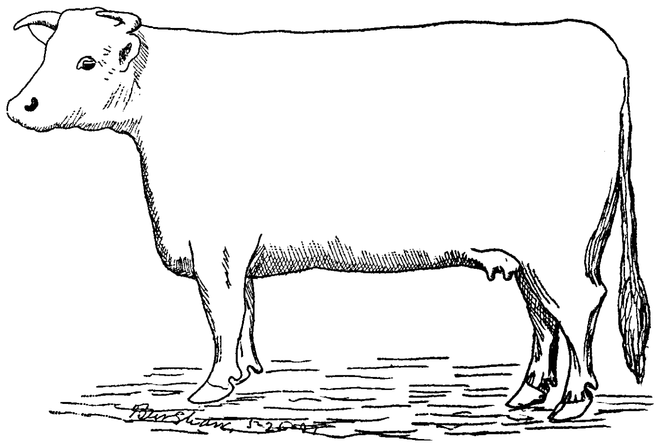
DAIRY FORM AND BREEDING.

By PROF. G. M. GOWELL, of Orono.

My Friends: I do not want you to think for an instant that it is an easy task for me to come here and attempt to talk about so simple a matter as a cow, because it is not. There is no question connected with our agriculture, from first to last, to which there has been so much thought devoted and with which there is so much uncertainty connected, as that in relation to the stock which we have. And while we may picture out a few ideal animals, or may bring them in here as live animals and attempt to score and judge them, and tell about their qualities, it is not the work of a novice by any means, and I do not want you to think that I am conceited enough to consider that I know all about it. I hope I know a little something about it, but it is only from the standpoint of a farmer talking to farmers that I want you to consider what little I say this morning.

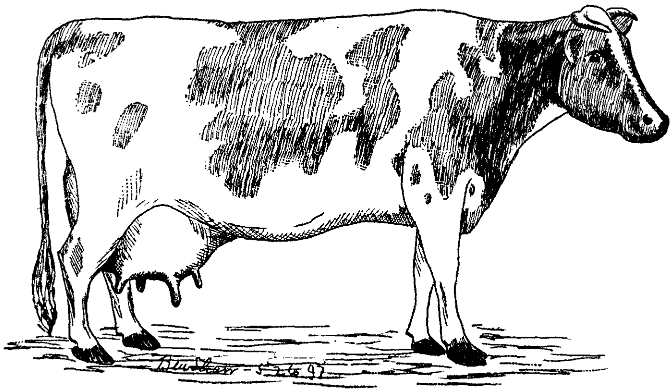
You know there has been a great advance in the stock industry all the way along. Away back as far as history goes we know but little about cattle. It is not until after a long period of the existence of man that we know anything about them. In ancient history we find them mentioned simply as cattle, and we hardly know what their form was like. But in certain parks in England descendants of those original animals that were found in the old North Woods have been kept by themselves all these years, and they are now, probably, correct representatives of what the original cow was like. All the breeds that we have, have descended from one common source, and the changes in form and function and the varying qualities they possess, have been the results of treatment and selection; part was natural, and part artificial. We very well know that England has given to the world really all it has in the way of improved stock—cattle, horses, sheep, or swine. To be sure, in recent years foreign countries have added something, and America has produced a few breeds of horses and cattle and a good many breeds of swine. But most of the sheep came from England, and England, because of its early civilization, the density of its population, and the intensity of its agriculture, naturally should be the center where these breeds have originated and developed. Three hundred years ago the agricultural population of England was comparatively dense, and the English farmers, being crowded together, wished to make the best disposition of the crops they grew on their farms; and the high price at which beef was selling brought them to the realization of the fact that the animals to which they were feeding their hay, grain and root crops were not satisfactory. And they attempted to produce animals that should give them more flesh. Flesh was what the Englishman was aiming at 300 years ago, and he attempted to produce a class of animals that would grow flesh freely and naturally. He sought out those animals that were quiet in disposition and thick in flesh, and as he gradually improved in his condition,—led a better life himself, had better buildings and better clothes,—so he gave to those animals better food and better care, and gradually developed them. And just as the Englishman increased in his improvements in living, just so the animals by which he was surrounded increased and became more valuable and more perfect types of flesh animals. He was aiming at flesh production and not milk production, because milk had but a slight value at that time.

We have a record of the breeding of different animals for 200 years, and the first class that was developed was in the county of Durham. Later on, these were known as Shorthorns. For 200 years this work of breeding went on; selecting certain families that were alike in peculiarities, and gradually developing this type of the Shorthorn animal, which was given the name of the county of Durham. The county of Hereford had another type, which are the Herefords we have to-day, and there were many other breeds. I have drawn an illustration of an animal of the beef type. We have here a four-year-old Shorthorn heifer. She is the Grand Duchess of Ridgewood, the prize animal at Chicago, and a true type of the beef form. You see that she is a solid junk of flesh. There is in that animal the largest amount of edible flesh that it is reasonably easy to accumulate in one animal of her size. Take that beef animal, and what markings do we have? We have an animal the side view of which shows a solid block with full square corners. You look at her breech and you will find a square back and sides; you have presented there a solid square end of flesh. Turn her face and you will find those broad



shoulders coming down square to and across the brisket. We find that if we draw a line from the shoulder back to the hip bone, the ribs are so well sprung out that they touch the line. We have a great breadth across the loin where the high priced meats are. And then again we find that when a line is drawn from the stifle to the shoulder point, it is a straight line. The belly is not so pendulous that it presses the line out of shape so as to cause a good deal of waste and cheap meat. You know that in those animals with pendent barrels there is a good deal of waste and cheap meat, and the Englishman sought to get rid of that and to get all of the high priced meat he could upon the back, and so he gave the animal a sprung rib and a broad loin, and also bred her so as to get a good amount of round steak,—not the best of steak to be sure, but much better than the flank. He did this by selection. He selected every time the cow that was the nearest to this type, and bred her to males that were the nearest to this type, and were descended from ancestors all of the same class. How is she as a milk giver? That heifer will barely give milk enough for her calf, simply because the instinct for milk production and the faculty of milk production have been displaced. It is a law in breeding that as you perfect one set of peculiarities you do it at the expense of others. We have perfected the flesh tendency, and have done it at the expense of the milk producing capacity. This animal is a miser, she stores up all the food nutrients upon her back, just where you want them. So much for the beef type.

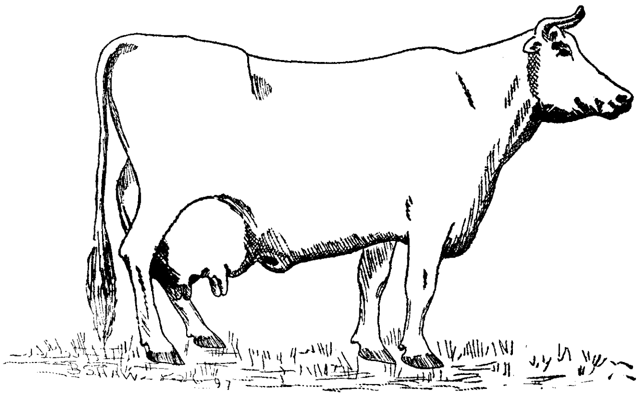
While this work of the Englishman was going on under the conditions in which he lived, right over in Holland the people were doing something else. They felt the necessity for a different class of food. On those low, marshy lands, that produced forage in such luxuriance and with such great ease, they wanted a different class of animals, something that would produce milk. They realized that milk was an exceedingly cheap and valuable food, and cheese became, not a luxury, but a necessity, and they wanted a cow that would give much milk. They selected from this old, original type a cow that would give considerable milk, and they bred her in those low lands where vegetation was luxuriant and but little exercise was required to procure her food, and after generations of this work, beginning 200 years ago, they developed a cow that gave an immense quantity of milk and ate enormous quantities of food. This is the work of the Dutchman. From his necessities, and the conditions under which he was living, he wanted a cow that should fill up on a large quantity of succulent foods, and with a digestion and assimilative functions so well developed that she would make the best possible use of those foods. He fed her hard and gave her but little exercise; but she did not produce flesh out of this food because by selection she had developed the milking function, more fully, than the fleshing function. What was her form? You saw in this beef animal that the back bone was closely united, coupled together very firmly. She has ribs that are round and sprung, with round edges. We find when we feel of the legs of an animal of the beef type that we have round bones. She has round hind legs and round fore legs, and as you put your fingers between the ribs they are close together, with rounded edges. An animal that has the tendency to devote its food to flesh production has round bones, and the bones are quite close together. But animals of the milk producing type have back bones that are loose jointed, so to speak, flat legs, and ribs so far apart that you can put three or four of your fingers between them, and you will find that the bones are sharp, when you feel of the edges. Wherever you find sharp bones you find a tendency, not to store the food nutrients on the back, but to give them up into the milk pail. This cow has not the peculiarity of



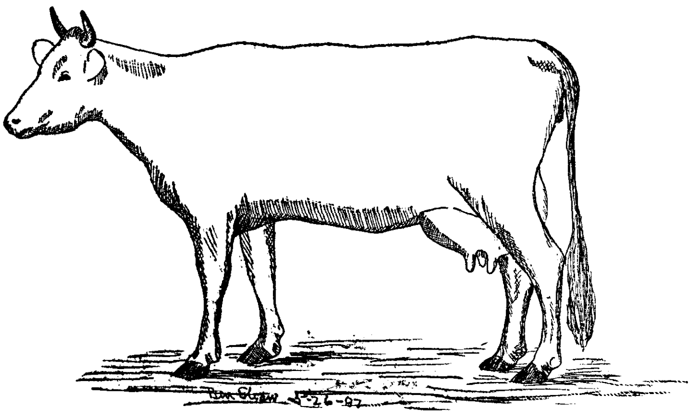
making flesh, but she has the peculiarity of making milk. The first point that strikes us is this tendency towards leanness. We find a slim fine neck, and a fine head; we find an animal that is comparatively light through the fore parts; and we find this immense depth through the flank. At that distance you will notice that the animal is wedge shaped, gradually widening towards the breech. She has not the great chest that the beef type of an animal has. What is there in that broad chest of the beef type that is incompatible with great milk production? We simply do not need that great development. We only want a sufficient chest, and a sufficient breadth through the heart so that large vital organs can be stored there. And then we want a gradual widening towards the breech and a gradual deepening through the flank, so that she may have a large development of the organs of reproduction and milk production. And we want this large barrel so that she can carry large quantities of food, and then we want the large udder. This cow is by no means a myth; it is the Holstein cow Aggie, who produced 18,000 pounds of milk in one year. I wonder if you realize what 18,000 pounds of milk in a year means. We have a few herds that give 6,000 pounds of milk a year, and you can occasionally pick out a cow that gives 8,000 pounds;

but here is a cow that has given two or three times as much as one of our best. She is a milking type.

When we woke up to this matter of dairying, we had been beef raising, sheep raising, horse raising, and doing general farm work. When we began to appreciate the market for butter and to try to produce butter, we went at it with the cattle that we had on hand, and we did not get very satisfactory results. We began to look about us for a better class of animals than our old natives were. About forty years ago the first Jerseys were brought into this country; and some from among the first came to Maine. Some of our ship-masters being half farmer and half sailor were attracted by the cattle on the island of Jersey, and brought some of them home to Maine. These formed the nucleus of the stock of dairy cattle which we have in the State of Maine to-day,—our Jerseys. The Jerseyman began to breed these animals 200 years before we were aware that we wanted to engage in butter production. Why did he do this? You know about the island of Jersey. It is not larger than your town here,—five or six miles square, and the people, living so close together, two acres being more than an average farm, to economize land could not afford fences, and were obliged to tie the cow out by a rope so that she could feed, moving the peg a foot at a time, carrying her a pail of water at noon, and at night bringing her into the hovel which was attached to the dwelling house, the women and children taking care of her, and feeding her from the waste of the farm. They sold their vegetables in the English markets, and fed the cow on the waste turnip tops and beet tops, and the little forage which they raised. They were compelled to live economical lives themselves, and this cow, from living with them, took on that same condition of economy. Environment is the cause of all the changes, aside from selection, that have been made in our stock of all classes, and thus for this purpose of economy the Jerseyman had perfected the Jersey cow. And when we got ready to do dairy work we found the stock already existing; it was only necessary for us to come into possession of those animals to do the work with. Why is she different from the Holstien cow? Simply because the Holstein cow gave a class of milk which was not rich in fat, and was not adapted to butter-making purposes, while the Jersey cow gave a class of milk that was adapted to butter-making, and gave it cheaply. You know about the composition of milk. The fat is not dissolved and mixed up with the milk, but it is in little round balls, so very small that if twenty-five were placed one upon another you would not get the thickness of a sheet of paper. In the milk of Holstein cows these globules are small and white, but in the milk of Jersey cows they are larger, and yellow and hard. In the milk of Holstein cows they are soft and greasy and break down quickly. You make butter out of the typical Jersey cow's milk and you have a mass of wax, not of grease. That is the kind of butter that the market is willing to pay us for. The Jerseyman realized that he was selling his butter at high prices in London and Liverpool, and he kept right on trying to improve the quality of the butter.

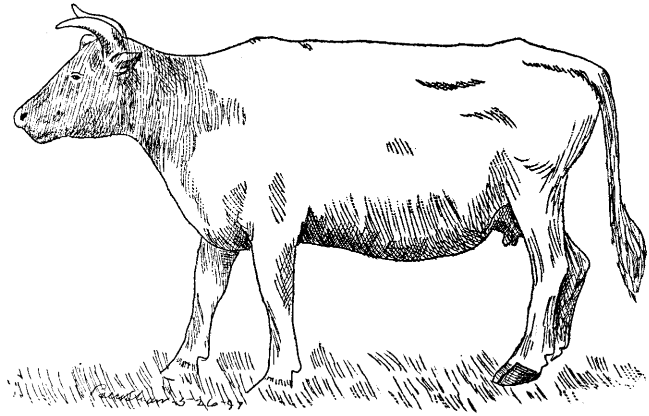


Let us look at her form. We find the same peculiar form of the Holstein cow, the delicate neck and the high head, the openness of bones, the wide separation of the ribs, the sharp edges of the ribs, with rather a more pendulous barrel, a wonderful udder, great milk veins, and fine, flat bones. And we find that she has a yellow, luscious skin, and is adapted to the production of a fine quality of milk. But that is not all. When we wanted to engage in dairying, and make a profit out of the business, and a market for the crops we were raising, we wanted to get out of those crops all we possibly could, and we were told that if we secured Jersey stock and bred to Jersey stock it was all that was necessary. We have been fooled, a good many of us. We have been satisfied simply with the term Jersey, and thought we had the right machine to do the work we wanted done. This cow, Jersey Belle of Scituate, made for five months nineteen pounds of butter a week. That is a wonderful record, though we have greater. And that butter was of a high quality. Now if we can get cows that will produce 300 pounds of butter a year, we consider ourselves fortunate. That is the figure we are aiming at; that is the standard, just as 2.30 is the standard for the trotting horse. When we can get 400 pounds we ought to congratulate ourselves, and hug ourselves very closely. It is within the reach of us all. That is the type of animal that we want. That cow can carry about with her a vast amount of food, and she has that great udder, which is what we want. She has a fine neck and a fine head, and she shows a bony structure, a resolution and ability to work.



Here is another type of cow, well bred and a pure Jersey. She is a differently formed animal, a finer animal. She has fine legs, a small barrel, rather a tucked up belly, and a comparatively small udder. Her legs are flat, and you find that thin, long neck; her neck is too long and her head is too thin. She shows that she is lacking in durability and strength. A machine is of no use unless it has strength. This animal shows in every part physical weakness, lack of constitution. That is the kind of animals that too many of our dairymen are fooling with at the present time. Too many of our farmers have that class of animals. Her pedigree is correct, her breeding is straight, but our farmers who are engaged in dairying as a business should not simply look to purity of blood without individual capacity. What we have to aim for, and what we have to talk about with every farmer and every dairyman in our State with whom we come in contact, is, that purity of blood is essential, but that individual capacity and capacity of immediate ancestors is what we must look at. This is the cow that is causing our creameries to show us that $20 or $30 per cow, per year, that I spoke of yesterday. We want cows of capacity. How we are to secure them is very plain,—simply by selection, breeding and care.

What did we start with? What did our people attempt to do dairying with, a few years ago, and what were we brought up with, as the typical cow, and what have we far too many of in the State of Maine? The cow that we tried to do dairying with thirty years ago was the old New England cow. When our ancestors came over and brought over the first few cows, and lived in the little cabins they erected on the New England coast, they had hard work to gain sustenance for themselves, and the cows lived the same kind of lives in those cold hovels where they were half frozen, and fed on the corn stover and wheat straw, and starved through the winters, having barely strength enough to come in with their calves in the spring, and drying up in the early fall. When we began to do dairying twenty-five years ago we found we were surrounded by that class of animals. I warrant you that if Mr. Ellis should tell you the kind of cow he was raised with he would tell you about this old New England cow. I remember the kind of cow that prevailed through all our section in my boyhood. It was this old New England cow, which I have upon this chart. She developed from her environment into that peculiar form. What function is developed in the greatest perfection? The function of self preservation. She had been made in that way so that she might starve through the winters and come out alive. We have a homely creature, with a large, pendulous barrel, so that she might eat enough of this coarse food, which had so little nutrition in it, to sustain her life. We find these long and slim legs so that she might escape her pursuers, the dogs and the wild animals. She has a long neck



and a homely head,—a homely creature that has been made what she is simply by her association with the men she lived with.

Cannot you see the reason why we have $20 and $30 creameries in the State of Maine instead of the $60 creameries that we ought to have? We are simply enjoying this old legacy that we have not gotten rid of. Or in getting rid of that, in our ignorance we have adopted something else which is unprofitable. The farmers have been fooled a good deal, and they have not been fooled all the time by politicians, but they have been fooled by cattle speculators. Somebody sent to Jersey and bought a bull which had a pedigree long enough, and all the farmers used him. They did not know whether his grandmother made ten or forty pounds of butter a week. They did not care for that for he had a long pedigree and a fashionable name. They bred to that animal and he has given them cows peaked in front and peaked behind, with no chance for the development of the organs of milk production. We must get rid of them before we can get satisfactory returns from the hay and grain we are feeding to our animals.

Now, my friends, it is not my purpose to-day to tell you how to breed cattle, or how to feed cattle, but there is one point that I want to talk to you about, and I think it is worth more than anything else I can say, and it is this;—a great deal of prejudice exists against the use of the score card in judging stock. We have these cards, and they have on them certain figures that are supposed to represent the qualities of the animals in the various classes, each class having a score card of its own. Our farmers distrust it. Too many of them have an idea that it was gotten up by fancy breeders, by visionary men, and that it is simply a fashionable arrangement and does not have to do with the productive or working capacity of the animal; that it does not represent anything. I do not know how sincere and capable the men who made the first score card were, but it has been gradually improved every year and made into a practical thing, so that by the score card we can analyze an animal and more correctly estimate its worth. And while the score card is not correct, it is in a large measure so. Our judges at the State and county fairs are being urged to use it, and I think we should bring every possible means to bear to have it used everywhere. The score card is simply based on this fact,—that we are able to judge of the internal peculiarities and functions of an animal by its external structure. When you meet a man you look him in the face to see what characteristics and peculiarities are reflected there. And every time a man meets another man does he not judge of the internal qualities of that man by his external markings and peculiarities? In just that same way we are able to measure the productive capacity and the internal qualities and functions of our animals by their external markings and forms. And for that very reason an analysis of this score card is worth something to us. You know how the score card is made. It is simply made by breeders coming together and choosing a committee and finally adopting a certain schedule that shall represent the various parts of the animal. I have here the Jersey score card adopted by the American Jersey Cattle Club.

AMERICAN JERSEY CATTLE.

FOR COWS.

Name..................................

	POINTS.	COUNTS.
Head—Small and lean; face dished, broad between the eyes and narrow between the horns..................................	2	....
Eyes—Full and placid; horns small, crumpled, and amber colored......................	1	....
Neck—Thin, rather long, with clean throat, and not heavy at the shoulders.............	8	....
Back—Level to the setting-on of tail........	1	....
Broad—Across the loin....................	6	....
Barrel—Long, hooped, broad, and deep at the flank...................................	10	....
Hips—Wide apart; rump long.............	10	....
Legs—Short.............................	2	....
Tail—Fine, reaching the hocks, with good switch..................................	1	....
Color and Mellowness of Hide—Inside of ears yellow.............................	5	....
Fore Udder—Full in form and not fleshy.....	13	....
Hind Udder—Full in form and well up behind.	11	....
Teats—Rather large, wide apart, and squarely placed.................................	10	....
Milk-Veins—Prominent..................	5	....
Disposition—Quiet........................	5	....
General Appearance and Apparent Constitution..................................	10	....
Perfection............................	100	

In judging heifers, omit Fore and Hind Udder, and Milk Veins.

FOR BULLS.

The same scale of points shall be used in judging bulls, omitting Fore and Hind Udder, and Milk Veins, and making due allowance for masculinity; but when bulls are exhibited with their progeny, in a separate class, add 30 counts for progeny.

It has been modified all the way along. We see at the head of the list the word "Head." The head of the Jersey cow is to be rather small and lean. First, I want to say that in the judging of dairy stock of all classes we have four things to consider. The first thing is the function of the animal,—what kind of work she is going to do. We know by glancing at the first chart that the function of that animal is beef production. Then we have to consider the amount of the product and the quality of the product, and then the constitution of the animal. We have to consider these four things,—the kind of work, the amount of work, the quality of work, and the constitution or physical capacity of the animal.

As I have said, the Jersey cow should have a fine head, dished, because the dished face always accompanies the milking capacity. The face should not be dished simply from the eye to the nostril, but dished between the eyes, which is an indication of refinement. Why do we want that fine, high head, and this dished condition? Simply because in judging the function we know that she will produce milk and will not produce flesh because of the structure of the bone. The head should be narrow at the horns, and have not too great a depth across the jaw. We want her broad at the eyes, because that will give her a great brain capacity. The head, taken as a whole, as you will notice on the score card, counts for only two points. It does not count for very much, but it shows her function. The eyes, you will notice, are to be full and placid, and the horns crumpled and of an amber color. The eyes and horns together only count for one point in the total makeup of 100, and yet how much stress the farmer ordinarily lays on the horn. The horn simply shows refinement of bone, which we can get by passing the hand over the animal anywhere. The eyes and the horns together go but a short distance in measuring the capacity of the animal.

Next we take the neck. We want a neck that is thin, rather long, with clean throat, and not heavy at the shoulders. We find here a neck not too thin, and where it is connected with the skull it is connected with fair strength. You notice that where it is joined with the shoulders there is a distinct marking, very different from the Shorthorn neck. In the Shorthorn cow you cannot tell where the neck stops and the shoulder begins because they are so united; they should unite very smoothly and cleanly in her. But in this animal we want a distinct connection. An animal with that type of a neck will devote her food to the production of milk and not to the production of flesh. If it is a perfect neck we give it eight points. If it is a very thin, weak neck, and there is a great depression at its connection with the skull, and it is cut up too closely in the throat, we would cut it some,—it would indicate that the animal was weak, lacking in constitution. By constitution we mean that vital force that the animal was born with, not something that has been fed into it; and we want to have as much of that vigor of constitution as we can, so that the animal can consume and digest large quantities of food.

What kind of a back do we want in the Jersey cow? Level to the setting on of the tail. This refers simply to the line. Many of our cows have perfectly straight backs, but this cow upon the chart has not a straight back, and she would be cut; but how much can we cut her? We can only cut her one point. The question as to whether that cow's back is straight does not count for very much on this score card. Its straightness of line does not reflect very much of the internal functions of the animal. In mature cows the back generally is depressed between shoulder tops and hips.

She should be broad across the loin. Why do we want this great breadth across the loin? Because we get a broad barrel,—where a good deal of food can be carried,—underneath it. We want that same broad loin that we wanted in the beef type, but somewhat sloping, while in the beef type it was level. And the reason we want this is that underneath the loin are joined the nerves and muscles connecting with the udder. The organs of reproduction and the organs of milk production find their connection here, and if you have an animal with a good, wide loin there is a large chance for the attachment of muscles and nerves. The milking capacity of the animal is reflected in the breadth of loin. From this we are able to judge of the function of milk production. It is worth six points if it is perfect, and if it is imperfect, cut it as much as you find necessary.

Barrel,—long, hooped, broad, and deep at the flank. We want the barrel long and hooped, with the ribs well sprung, and we want that barrel carried well up. We want a great barrel so that the cow can carry a good deal of food there. We want it deep at the flanks because of the connection with the milk producing organs, and well held up at the fore flank. The perfect type of barrel counts ten points. We judge of the productive capacity of the animal by the barrel, very largely. If it were a very defective barrel we should have to cut it perhaps five points, as much as if you took off her head, her eyes, and something else. Why? Because the loss of this perfect barrel would count for more in the makeup of the perfect Jersey than a good many of these minor points that fanciers, sometimes, attach so much importance to.

The legs of the cow should be short, flat and broad, and should not cross in walking. The legs reflect the fineness of bone, and indicate the peculiar use to which the cow will put her food. We want them flat, because she will devote her food to the production of milk and not of flesh, and we want them broad as an indication that she has a sufficiently strong, bony structure. They should also be crooked, because a crooked leg always accompanies milk production. And the legs should not cross in walking. How many times you have seen cows that carried large udders, and as they hurried along, their legs crossed and they were constantly switching and pounding the udder. That is a very great defect; and yet the perfect legs only count for two points.

The hips should be wide apart and the rump long. The same reasons could be given for this as for the width of the barrel. Under the loin and the rump are stored the milk producing organs and the udder, and if we have wide hips and a long rump there is an opportunity for a large udder attachment, which is absolutely essential in great milk producers. These wide hips count for ten points. If she had hips that were narrow, and a short rump, she would be cut down four or five points, more or less, according to the defect. This is valuable, because it reflects valuable parts.

We come now to the tail. A few years ago breeders asked for a switch hanging low down to the ground, fine in its makeup, and black; and they talked more about the tail than about the udder. They seemed to think that the tail reflected something in the makeup of the cow. The only value the tail has is to reflect the fineness or coarseness of the bone of the animal. It means the use to which she will put her food, and counts for but one point. And breeders used to say that you must look at the roof of the cow's mouth, and if it was black, and the tongue black, it made a difference of $100 in the selling price of the animal. An animal that would sell for $300 if she had a black switch and a black tongue, and the roof of her mouth was black, would be cut down $100 if she had the same structure and these were of a lighter color. We have gotten over that nonsense; it was a fancy point and did not mean anything.

Next comes the skin. If there is any one point that is not given its due value on that score card it is the skin. When we take hold of a cow's skin we want to take up a handful of soft, luscious hide. We do not care if it is pretty thick if it is only fine and soft. You know that in the skin of both man and animals there are little pores where the perspiration escapes, and the foul matter is thrown off. If there are a good many of these going to the surface we find that the hide is soft; and the closer together and the more active these are, the softer the hide. If there are but few we find a harsh, firm hide. The beef animal with a stiff hide is not a thrifty animal. Every dairyman should reject animals with stiff hides. Then, permeating all through the solid part of the animal are those little capillaries that are carrying the food nutrients in the blood through every part. If the skin is soft and there are a lot of these pores going to the surface it is an indication that these little capillaries are in great numbers, and there is abundant opportunity for the carriage of large amounts of nutrients into the milk. Some investigator has ascertained the number of these little drain tubes in the surface of the skin of an ordinary man, and it is said that there are more than eight miles of them. The feel of the hide of a cow indicates the peculiar work she will do. It is the hardest thing to describe. Your good milker always has a soft hide, although it may not be a thin one. But beware of a thin, soft hide. When you find a cow that has a hide that is thin you know that there are lots of capillaries, that the opportunities for nourishment are ample and perfect, but you also find that there is lack of vital force and energy, a lack of stamina. When you feed that animal on the full ration that the Director indicated last night, and expect her to do work for a period of years, she will break down. She is like that low-priced, nash, light running mowing machine that would only run one season and then all snap to pieces. You want an animal that has strength and vigor. The hide counts for only five points, but I think it is too low. I would give it ten; but the score card was not made by one man, and I am glad that it was not. I might be in error, but I believe we do not place importance enough on the hide. It is the hardest point to judge—to discriminate between an abundance of constitution and vigor, and a lack of it.

Now we come to the udder of the cow. You will notice that the fore udder, if it is perfect, is given thirteen points in the makeup of that animal. Why should it be so? You will notice that the hind udder is given eleven points and the teats ten more, so that there are thirty-four points in the makeup of this 100, in the udder, and only two in the head, and one in the eyes and horns. Why should such value be given to the udder and the teats of the animal? Simply because they reflect the milk producing capacity of the animal very largely. You know that it is in the udder of the animal that the milk is made. The blood that is formed in the healthy animal is carried back through the arteries to the udder, and the udder is filled full of those little tubes, and as the blood passes through, the opportunity for milk production occurs; and if there are many of those little capillaries the capacity for the production of large quantities of milk exists. The udder is the laboratory where the cow manufactures milk from the blood, and if we have a large laboratory, well equipped, we shall have large quantities of milk. Her first province is to make blood out of her food; and then the blood, going to the udder and passing through it is worked over into milk. And we want a long line of connection with the udder. It should reach high up and far out on the thighs; simply because this great line of attachment indicates that there is an opportunity for the passing in and out of large quantities of blood. The udder is divided into four parts. If the fore udder is perfect she is given thirteen points. What is a perfect udder? The description is that the udder shall be square and level on its base, and not cut up, and that it shall reach far forward. But suppose that the udder is cut up somewhat, as you very often find it? Many of our cows have udders that are cut up in front, and considerably lower behind. Our great milk producers often have udders of this peculiar shape. According to the score card we can do nothing but cut them down a few points, but I query whether this is right or not. I think that our breeders are making something of a mistake, in trying to place Ayrshire udders on Jersey cows. The Jersey cow has a pendulous udder and does not have the flat udder that the Ayrshire has; and we are trying to judge them from the standard of the flat udder, and in so doing are rejecting lots of grand working animals. I would have the udder flat if I could, but would not sacrifice a good working animal on this account. But we must insist on a long line of attachment in front, so that we may get the opportunity for blood circulation.

The hind udder should extend far up behind, with this broad connection on the thighs. When that condition exists we credit it with eleven points. It should be full in form and well up behind, and the teats far apart and well spread, coming out of the various quarters of the udder. That is correct, but in many of our great producers the teats have a tendency to come out nearer together and not from the corners. Do not, in your work, sacrifice everything for the Ayrshire style of udder.

Now the milk veins. You know the office of the milk veins is simply the carrying of the blood, that has passed through the udder, back to the heart. These veins reflect the measure of blood that is passed through the udder, and you know that in great producing animals large amounts of blood must pass in and out of the udder. This counts for five points.

Disposition—The Jersey cow has been given this quiet disposition that she possesses simply because of the kind treatment she has received. We want a kind animal, and we find that kind animal in the Jersey when she has been properly bred. It counts for a great deal. Judging her high for her mildness of disposition, we know that we are able to secure the largest measure of milk from her. Do you know how this comes about; this matter of sympathy with the cow? The Jersey cow has been bred for a long time, and her calves taken from her, and man has milked her, until she has gradually turned to the man or the boy as her calf. She has accepted him as her calf, and just so far as he has treated her kindly, she has given to the man all the milk she is able to produce. And the dairyman who comes into full sympathy with the cow, and has succeeded in fooling her into thinking that he is in reality her calf gets the greatest flow of milk. We have one man at the college, a teamster, who is able to do this. Sometimes the men who do the milking are sick, and this man comes in. He can get more milk from our cows than any other man that we ever had, simply because his touch is so gentle and his sympathy so complete that they yield to him at once the measure of their lives just as they yield it up to their calves. We want a cow that is kind and quiet, and takes readily to the ways of man. This counts for five points.

Now comes the matter of constitution. That counts for ten points, and it is worth all it counts for. Unless we have an animal that has a great deal of vital force and stamina and can do our work for years we have a machine that is worthless. But, I have talked too long. I have already trespassed on the next speaker's time and I must stop.

BARN SANITATION.

By Dr. F. L. Russell, Veterinary at State College, Orono.

Barn sanitation is the subject that has been given us to speak upon this morning. If any apology is required, it will be for the manner of presenting it and not for the subject itself.

We have in this State from fifteen to eighteen million dollars worth of stock, and whatever has to do with the health and productiveness of this vast amount of living property is important enough to command our attention. All disease among our domestic animals does not originate in the barn on account of unhygienic conditions that exist there, but it is safe to say that most of it does.

The barn-building world has not stood still while all the rest of the world has been on the move, although some individual barns belong to a past age. As we now find them in this State barns are a comparatively modern invention.

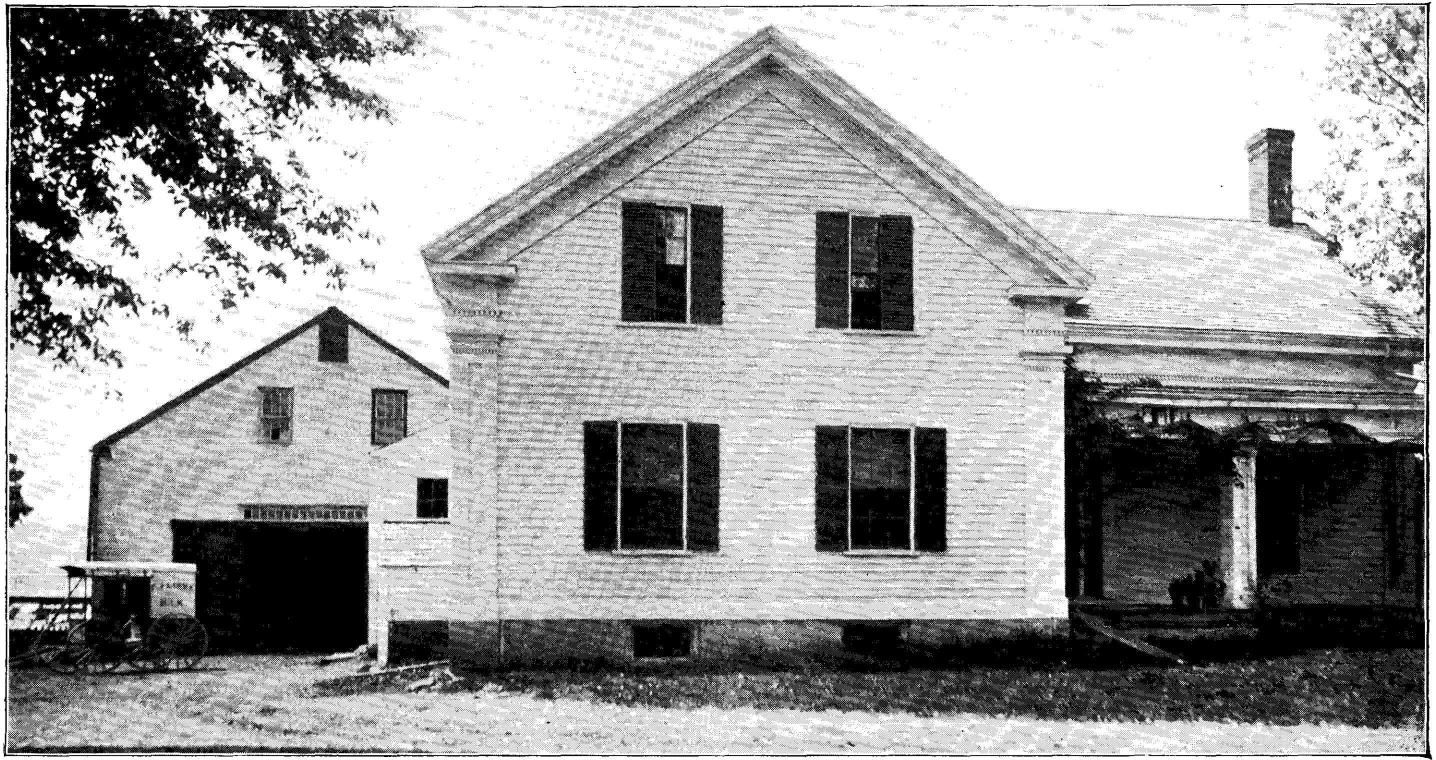
Their development has been a natural result of the improvement in the quality of our flocks and herds, and the great changes that have taken place in our stock industry during the past two decades.

Better stock will pay for better care, and the result of much study and experience has found expression in the modern barn with all its appliances for the convenience of the owner, and the comfort of his stock.

With all that has been accomplished there is yet room for the progressive man to improve on the best that we now have, and it is apparent that the best is far from common.

We do not intend to discuss barn sanitation from the standpoint of a radical reformer. We realize that stock is not kept for its own sake, and any method of care that has nothing to recommend it but the improved health of the animals is not likely to be generally adopted unless the expense involved will pay.

We wish to discuss the subject from the standpoint of the man who has his living to make and wants it to be a good living, easily gained. We presume that includes most of us.



FARM HOME OF MR. F. J. LIBBY OF RICHMOND.

To the degree in which our dairy cow is removed from the type of the physically well-balanced, self-supporting natural cow into the modern milk machine, she is dependent upon and will repay the same kind, intelligent care that has been instrumental in her development.

It is only possible in a general way to indicate what that care should be. The owner must have a good endowment of brains of the kind that is sometimes termed good horse sense in order to make the most of his individual opportunities. Our dumb servants are not all made of the same clay, or turned out of the same mold. As their individual characteristics differ so must they each be cared for according to their individual needs. No universal rules can be rigidly enforced under all the varying conditions of individual peculiarities, and environments. What is best for one set of conditions may not give the best results in another place, and under different circumstances.

We would say then that native good sense on the part of the care-taker is the first essential, but for the highest efficiency this natural endowment should be well cultivated by familiarity with the experience of others, and by considerable individual experience.

The native cow is endowed with brains enough to meet the needs of her own existence, but it requires an intelligent man with good training to use to the best advantage the high type milk and cream producer that satisfies our conception of a good cow. The machine itself, while it may be highly esteemed, cannot be regarded as of more value than that which it is capable of producing. Much thought, care, and intellect have been put into the development in order that we may have animals that will pay for care, and if the highest returns can be obtained only at the expense of the animal itself, the end will justify the means. It may be worse for the cow but better for the owner. The looms in our cotton and woolen mills can be run so slowly and cared for so painstakingly, that they will last indefinitely, but it does not pay to use them in that way. To return the largest dividends they are run at a high rate of speed by skilled operators, and are soon worn out. We must make our animals serve us, and not be slaves to them while getting no profitable return. We must make them pay for what we do for them, and a good profit besides.

If they have been wisely used and have worn out in the using, we can afford to fill their places with, at least, as good animals. It is not a valid argument against warm stables and high feeding that the cows soon break down. That method of feeding and care that gives the greatest net profit must be regarded as wise, no matter what the fate of the cows may be. Let us suppose that a cow be kept under the best hygienic conditions with the end in view of keeping her in the highest state of physical vigor. Let no pains be spared to attain this end. We would have to create a sort of artificial, perpetual June for her, and this in a climate where there is quite as much December as June. If we succeeded in our endeavor we might expect this highly favored cow to live to ripe old age. But who is to pay the extraordinary expense involved in such elaborate care as would be required? We think it would have to be her shorter lived sisters who have been kept at work on a paying-for-what-they-get plan. Do not mistake my meaning. The best sanitary conditions are always worth something and should be obtained if the cost is not too great. We are not here to advocate any system that will not bear the test of practical use. If the best conditions are not practicable, get the best you can. In these times of close competition we must have the best stock obtainable and give it the best care that under the circumstances it can pay for. The better the stock the more painstaking care can be wisely expended on it. Just what that care shall be each man must decide for himself, according to his individual circumstances.

In considering barns as a shelter for stock we have to regard them as necessary evils. Necessary because of our climate, evil because it is impossible to keep stock in even the best of barns without in a degree endangering its health and vigor. The barn problem to be solved is how can we make our barns convenient and satisfactory shelters, and not at the same time have them sources of danger from diseases. Along this line we are not prepared to advocate much that is new, but perhaps some things that are not common. There are barns that exemplify the best that is known of sanitary requirements as far as is practicable. There are more that follow behind this knowledge, some a long way off. With the best interest of our stock industry at heart we ought to aim to make the exceptions the rule, and the only way to do this is to keep trying.

Within our remembrance much has been accomplished. The barns are now not common that were constructed so as to exclude only the coarsest of the cold while freely admitting wind and snow on every side. In avoiding its defects some have fallen into the opposite extreme, which is quite as objectionable, and have shut their stock into air tight structures with nothing to recommend them but their warmth. The ideal barn, it seems to us, should have all the good qualities of these extreme types, and avoid their objectionable features.

Pure air is cheap and always available. It is also too essential to animal life to be lightly dispensed with in our barns. On the other hand it costs something in the shape of feed to warm up frozen air. So too much of it must not be admitted. Warmth we must have. Light must also be provided. It is as essential as warm air.

To have pure air it must be admitted from the outside. We do not know any feasible plan for manufacturing it on the premises.

How to best admit this air is a problem that we think has not yet been solved. The amount needed depends upon the animals and is a very constant quantity. When it is extremely cold outside and the wind blows briskly it may be difficult to keep out an excess of air that will constantly enter every crack and crevice. But when the outside temperature is nearly the same as that on the inside, and no wind is blowing, it may require that every window and door be opened for sufficient ventilation. Thus with constant changes in the outside conditions, it is not a simple matter to admit just the needed amount of air at all times.

The supply of fresh air must be constant, but the means by which it is obtained must in some way be controlled, so there will always be enough and never a great excess. We know of no self-regulating arrangement for accomplishing this. It can only be accomplished by constant and careful attention. Whether the air be admitted through windows and doors or through specially constructed ventilating shafts is immaterial, provided it is admitted and care is exercised that no animal shall be rendered uncomfortable by standing in a draught. It should also be borne in mind that fresh air will enter most readily on the windward side with an opening for the outward blow of second-hand air on the opposite side. Each mature cow needs not less than 3,200 cubic inches of new air each minute. This is over 2,600 cubic feet in the twenty-four hours, and the supply must be constant. She cannot get a day's supply during the few minutes she may be in the open air getting the water she needs. Neither can she get it during the day and then be sealed up for the night to constantly use the same supply. She can drink enough in five minutes and eat enough in two hours to satisfy her needs for a day, but fifteen or eighteen times a minute, nine hundred times an hour she must have her supply of fresh air. And this each hour in the day, and each day of her life.

The air once breathed is poison if breathed again, so it must be gotten rid of, warm though it may be. If we could devise a feasible method of saving this heat without retaining the bad air we would be doing a great deal for the dairy interests in such climates as ours. There is one cheap source of heat that is seldom sufficiently appreciated. We refer to the direct heat from the sun. A few clean windows on the sunny side will admit a very appreciable amount of heat during a sunny day. You may say there is loss of considerable heat through these windows during cloudy days and nights. But we have learned to prevent much of this loss in our houses by means of double windows for cold weather. May it not be true that it would be wise to adopt the same expedient in our barns, or accomplish the same end by means of tight wooden shutters to cover most of the windows when the sun does not shine? Again we would ask if there are not many so situated that they would find it economical to raise the temperature in their barns a little during the coldest of the weather by means of a wood or coal fire. We have no doubt that it would pay many to provide one room, at least, in their barns that can at any time be made entirely warm and comfortable for sick or wet animals. It will sometimes be the means of saving a life that could not otherwise be saved. Blankets as a means for keeping our stock warm are worthy of consideration in special cases, but for constant and general use they are open to the objection of expense, and they do not satisfactorily protect all parts of the body.

In regard to the matter of keeping our barns warm the practical question is constantly arising whether we shall keep our barns well ventilated and cold, or warm and foul. There is no question in our mind but that, from the standpoint of health alone, we had better secure pure air even at the sacrifice of much heat. Nature has provided a way by which our domestic animals can keep warm under extreme conditions of cold. Their hair which lies smooth and slick on a warm day will be rough and stand out on a cold day. There is no doubt but the rough coat is warmer than the smooth one, and their exposure to the cold will demand more food to maintain a normal temperature. For the sake of profit, however, we believe it pays to keep animals in fairly warm quarters, and if they cannot be obtained at less expense in some other way it may be advisable to risk the health of our animals in a poorly ventilated barn. From a health standpoint dark barns are to be avoided. Direct sunlight undoubtedly has a beneficial effect. The reason for this may not be entirely clear, but our cattle and horses evidently appreciate a sun bath. Direct sunlight is fatal to many disease producing germs. It is a well established fact that the tubercle bacillus is quickly killed when exposed to direct rays of the sun. This fact alone furnishes sufficient reason why sunlight should be freely admitted to our dairy barns.

Food of a kind adapted to the nature of the animal in sufficient quantity, with excess, is essential to health.

Without entering deeply into this phase of the subject we would refer to two or three points in connection with feeding animals that bear closely upon their health. Animals are creatures of habit, and established food habits should not be lightly interfered with. A sudden and extreme change in the quality or quantity of food often results in a serious disturbance of health. Disregard of regular times of feeding keep animals restless and uneasy. Certain foods are constipating and others laxative in their effects. By a judicious combination of different kinds of feed the action of the digestive system can usually be maintained at its best. Individual characteristics make it necessary to vary our method of feeding to suit individual cases. Some animals will require frequent feeds of laxative foods.

The question of a water supply is an important one. Water may be far from pure and healthful and still look and taste well when freshly drawn. Many wells on account of their location are little better than cess-pools for the drainage from house and barn. It is safe to regard old wells with suspicion if they are located near buildings. This is particularly true if the wells are shallow. All the water that finds its way into wells passes through surface soil, and if the soil through which any given well obtains its supply of water is saturated with organic matter from kitchen waste or human or animal excrement, the organic matter finds its way into the well and contaminates the water. If the amount of contamination is slight and considerable water is drawn from the well it may not be a very serious matter. There is a very simple method that is also very satisfactory by which the purity of the water may be tested. Partially fill a perfectly clean bottle with the water to be tested, cork it tightly and set it in a warm place. If it remains clear and free from disagreeable odors it cannot contain much organic matter. The old wells on many farms may be regarded in the nature of of an incumbrance. If every man that sells a farm would reserve the well and remove it with the personal property, it would often be fortunate for his successor. It has always remained where it was first located. Successive owners have rearranged the buildings but never disturbed the well. What was once a good location may now be a very poor one.

To insure a good water supply it is necessary to dig a new well. If possible this should be located on high ground, remote from buildings and connected with the buildings by means of galvanized iron pipe. Thus a good supply of water may often be obtained without pumping, which is a matter of great importance. Sometimes good water can be obtained from a poorly located well by lining it nearly to the bottom with a good cement, or in some instances attention to the source of the contamination will remove all danger from them.

The ideal method of watering stock, from a sanitary standpoint, is to allow them free access to pure water. By this method they are always satisfied, and never in danger of drinking too much at one time. But there are objections to having water before cattle in the barn all the time which have never been overcome. It is so difficult to keep the water and drinking fountains before the cattle entirely clear that they are often in a very objectionable condition.

The stalls also are often wet from the slopping of the water. Again, closely housed cattle are benefited by even a few minutes unrestricted freedom in the open air—a benefit that they lose when the water is carried to them. To supply feed, water and shelter for our stock is not sufficient. For the best results in health, and other regards, each animal should be kept dry, clean, and contented. We must leave nothing undone that would add to their comfort.

These animals that we have in a measure created for our use have some claim upon us. We cannot ill-treat, or neglect them. Their happiness and well-being is in our hands. We must give them intelligent care or they suffer for our ignorance. We must care for them as well as we are able, according to the best knowledge available to us, for we have no right to do less, and because our own interests demand it. Too much emphasis cannot be placed upon the importance of entire cleanliness in relation to all the surroundings and the arrangement of the stock barn. This is perhaps of more importance in these days of co-operative creamery enterprise than ever before. From a pecuniary standpoint it is of the greatest importance. It is a matter that each patron of the creamery is interested in. Failure in this direction on the part of one affects the many. Those creameries that are able to enforce rigid rules in regard to cleanliness of stock, barns and dairy appliances have the advantage in the butter markets. It is impossible for butter that is made from milk that starts from a filthy barn to reach the highest markets. Conn's bacillus 41, or any combination of bacilli, cannot remove the taint with which milk leaves the filthy, bad-smelling barn.

The same general principle holds in the care of sick animals that pertains to the care of the well. They must be kept comfortable. Very often the sick animal is not worth the time, care and thought necessary to restore it to health, but if any treatment is considered advisable, remember that good nursing is often the most important treatment, sometimes, in fact, the only treatment that is necessary or of any value. The comfort of the animal must be studied and promoted in every way possible. Do nothing merely out of sympathy, simply because the animal is suffering and you want to do something for its relief, but let all your efforts be suggested by good sense, and have a reason behind them. When you know of nothing that you can do to help the patient it is usually best to do nothing. Give nature a chance to co-operate with your most intelligent effort. Do not balk her efforts by interfering unreasonably. It is quite as well to be very saving of your medicine. Medicine has its place and is frequently necessary, but it is an edged tool that should be handled with great caution. Medicine that is powerful enough to be of any use in an emergency is powerful enough to be injurious when unnecessarily administered. We fully believe that if all the drugs enumerated in the pharmacopoeia were sunk in the bottom of the sea our sick animals would be better off, but we should pity the fishes. It is a safe rule never to give any medicine at all without having a well grounded reason. Those medicines for which interested quackery claim everything, proclaming them far and wide as cure-alls for all kinds of unrelated maladies, had better be left severely alone. They are advertised solely in the interest of the manufacturer. You take more risk in using them than in doing without them. The height of unreasonableness in relation to the use of medicine is reached when extravagant prices are paid for mildly harmful drugs to feed to well animals to keep them well or render them the more productive. Better invest your money in lottery tickets. There is a thousand more chances of getting it back.

The whole question of barn sanitation is complicated by existing conditions that are more or less permanent in their nature. Could each of us choose the location for our buildings and construct them ourselves we might have things more nearly as we like. This is not always possible. Yet cannot something be accomplished? Do we not often submit to circumstances that we ought to control? Do we not sometimes get into the ruts and fail to do as well as we know because we are accustomed to do otherwise? Sometimes, perhaps, because we cannot have everything as we would like it, we fail to make some improvements that are entirely within our reach. That man is to be pitied who thinks he has reached so near perfection in the line of his calling that he does not deem it worth while to consider any further improvements. The world moves all the time, but man may stand still. The farmer who will keep in the van of progress in this the last part of the nineteenth century must be able to appreciate his needs, and leave no effort unexpended to meet them. If our barns are not well constructed they must be improved. If we have been looking for the best returns without paying attention to the best means, we can be but disappointed.

EXPERIMENT STATIONS AND THE DAIRY INDUSTRY.

By Prof. Charles D. Woods of Orono.

Mr. President, Ladies and Gentlemen:

Mr. Levi, the clothier on Chatham Square, had occasion to go out of the store for a little while, and there was no one to leave but his boy, his son Isaac. He said, "Now Isaacs, my son, I haf to go up de shtreet a liddle vile, and here I leave you mit de shtore. De goods, dey is all marked so very plain. Upon each check you find a dot, dat means $1.00; two dots mean $2.00, three dots mean $3.00, und so on. Isaacs, if some customers comes in, you sells dem de goods." He went up the street and was gone a while, and when he came back he said, "Isaacs, my boy, haf you sold some goods?" "Yes, I haf sold some pantaloons." "How much have you received?" "$13.00." "$13.00! Dere vas no pantaloons in de shtore dat vas more dan $6.00!" The boy took up the check,—"One dot, one dollar, two dots, two dollars, three dots, three dollars, four dots, four dollars, five dots, five dollars, six dots, six dollars, seven dots, seven dollars, eight dots, eight dollars, nine dots, nine dollars, ten dots, ten dollars, eleven dots, eleven dollars, twelve dots, twelve dollars, thirteen dots, thirteen dollars." "Oh! my son Isaacs, Got bless de flies!"

He got there by chance. The farmer has been trying to get there by chance; sometimes he has arrived, oftener he has not.

THE FIRST EXPERIMENT STATION.

I have found in talking with people that there is a more or less confused idea as to what experiment stations have done, and are doing, and should do for agriculture, and I have thought that perhaps it would be worth our while to review very hastily the experiment station movement in the world. It was less than 50 years ago, in 1851, that some German farmers in the village of Moeckern, near the city and university of Leipsic in Germany, believed that the agricultural situation was such in their particular vicinity that if they were going to get along and make a margin of profit it was necessary to call science to their aid. Liebig in Germany, Boussingault in France, and Lawes & Gilbert in England had been working along on some of these fundamental scientific problems, and had in a sense blazed out the path which these farmers at Moeckern proposed to follow. They got together, called a chemist to their aid, and later on, with the aid of the government, founded, in 1851, the first agricultural experiment station in the history of the world. They made the mistake that the most of us farmers would make if we were going to establish an experiment station, they established it on a farm. We have gone along making the same mistake, having an experiment farm as a part of our experiment station equipment, and perhaps for some reasons it is advisable. But the best work that experiment stations are doing in agriculture is not done upon the farm, paradoxical as it may seem. This experiment station near Leipsic did so much good that another experiment station tion was soon established in Saxony. Although the first station was started in 1851, in 1856 there were five stations in Germany; in 1861 there were 15 experiment stations in Germany, in 1866 there were 30, and to-day in Europe there are considerably over 100 experiment stations.

Under the conditions which existed in America we did not for a long time meet the same problems that had confronted the German farmer. It was only in the older parts of our country that we were experiencing the need of an improved agriculture.

In 1875, when the Connecticut Legislature came together, Mr. Orange Judd, the founder, and then proprietor, of the "American Agriculturist," who was living at Middletown, Conn., made a proposition to the board of agriculture and through them to the legislature, that if the legislature would appropriate $2,800 for two years for an experiment station, he would personally give a like sum, and the Wesleyan University would place the services of their professor of chemistry, and their laboratory, at its disposal. The legislature accepted that offer, and thus the first experiment station on American soil begun its work 21 years ago the first day of last October. That work justified itself, so that at the end of the two years for which the appropriation was made, or rather, before the end of the two years, as the legislature met in one year from the following January, they made an annual appropriation of $7,000.00 for the continuance of the experiment station. The Connecticut experiment station was begun in 1875, and has continued and is continuing at the present time, being one of the very best as well as the earliest of the experiment stations. This station proved so successful that soon after one was established in North Carolina, another in New Jersey, and so on until in 1880 there were four in this country, and in 1887 there were 17 experiment stations in 14 different states, some of the states starting two or more. In that year (1887) Mr. Hatch of Missouri, who was a member of Congress, introduced a bill which has come to be known as the Hatch Act, whereby $15,000 annually was appropriated by the national government, under certain conditions, for the establishment and maintenance of experiment stations in every state and territory which would take advantage of this grant. This Hatch act called into existence very many new stations, so that to-day there are in our country over 50 agricultural experiment stations. The agricultural experiment station movement has spread to every continent, so that to-day there are experiment stations in South America, Asia, Africa and Australia, as well as in America and Europe.

ARE EXPERIMENT STATIONS PROFITABLE?

In the United States, as I have said, there are more than 50 experiment stations, with over 500 men working along the line of agricultural investigations; and it costs considerably over three-fourths of a million dollars to support these stations. Now the question naturally arises at once, Are the stations doing anything to justify this enormous expenditure of money? When the first experiment station was established in Connecticut it was established more especially because of the abuse of the fertilizer trade, and in the first year of the existence of that experiment station it saved to the farmers ten fold more than all of the money which the state of Connecticut has put into experiment station work. The information which has been given on the spraying of trees for fungi and for insects, alone, has more than paid, in my opinon, all of the costs that the experiment stations have been to the states and to the national government.

We are quite familiar with the Babcock test. That was the invention of an experiment station worker. It was given to the American public by Professor Babcock. If he had placed a patent upon his apparatus the income would have been enormous, and the price, of course, would have been correspondingly high. He gave it to the American public, and that gift of an experiment station worker is worth to the dairy industry of America, in my opinion, every cent that the experiment stations have cost this whole country, even if they had never contributed anything else. So I think there is but one answer to that question, and that is that the experiment stations are paying a hundred fold on their investment.

There is one other reason why it seems to me that an agricultural education, and the experiment station itself, is justified on a higher basis than on the dollar and cent basis. It has elevated farming; it is bringing farming to a scientific basis. Twenty-five years ago you heard people everywhere in the rural districts spoken of as hay-seeders. You have not heard it for years, and you have largely to thank three things—the agricultural college, the experiment station, and the grange.

THE KIND OF WORK STATIONS ARE DOING.

Now I want to say a few things as to what an experiment station may do, or what the function of an experiment station is. In the first place the experiment station is for the farming class. If you want to know anything about agriculture at any time, so far as your experiment station can answer your questions, it is ready to do it. It is ready to do it in the bulletins which it distributes, in which it tries to treat of the subjects of the farm in language that the ordinary farmer can understand. The experiment station is also at your service when any problem comes up in regard to feed. If you want to know something about your rations, you have simply to address a letter to the Director of the Experiment Station and you will get what we can give you. We are not infallible by any means, and agriculture is not a thing of rule. One cannot lay down definite laws for it, one can only establish certain general principles, and every man has got to work out his own solution for himself, but the station is there to help him.

Now we will speak of some of the problems which the experiment stations undertake. They explain the tillage of the soil. "The tillage of the soil," you say, "We know all about that. We till the soil to kill the weeds." Bless you! That is the least important thing. The weeds are a blessing, because, they have made us till the soil. In the experiment stations scientific men began to study why it was an advantage to till the soil. I have seen a woman, when she had a plant in a dry time and thought it was necessary to carry it over the dry spell in some way, go out and pour a little water around it. She was making that plant lose what little moisture it had. If she had stirred up the soil she would have enabled it to retain the moisture. The oil in a lamp travels up the wick, goes up the little tubes. If you take a glass tube and put it in a tumbler of water, the water will climb up the tube, and the finer the tube the higher the water will rise. There is a force of gravity which is pulling the water down, and there is another force, the force of capillarity, which is pulling things up. The soil is full of little tubes leading down to the water below, and this water is continually going up through the tubes and evaporating. But if we mulch it or go over it with a hoe we cut off all these little tubes, so that the water will not pass off into the air. That is one of the things that experiment stations have brought to light. They are studying the nature and the action of manures; the culture of crops; the food and nutrition of domestic animals and of man; the production of milk, butter and cheese; the diseases of animals and plants; and indeed, whatever the farmer needs to know and science can discover, it is the purpose of the experiment stations to disclose.

FERTILIZER AND OTHER INSPECTIONS.

Among other things, experiment stations are doing police work; such as the fertilizer control, the inspection of creamery glassware, and things of that kind. The resources of our experiment station are from the Hatch fund of the United States, and this fund cannot be used for police work. It is given for the purpose of investigation. You may say that this is investigation, but it is not; it is simply finding out whether a thing is a fraud or not, and that is not investigation. So whenever we have any work of that kind to do it is necessary that in some way the station be paid for it. In this state that is accomplished by making the manufacturers or the dealers pay a license fee. In the case of the creamery glassware, the creamery or the dealer pays for it, and the purchaser of the apparatus pays for it also in the added price that is put on for the cost of the inspection. Your experiment station does make some studies along the line of fraud, because it has to pave the way for good law. For instance, the experiment station finds that cotton seed meal is coming into the State which does not look natural and right. They examine it and find that instead of containing 40 per cent of protein it contains only 20 or 25 per cent, and they call the attention of the board of agriculture to the fact that a fraud is being perpetrated and suggest that we have a feed control; and if the legislature thinks it wise to entrust this control to the experiment station it is taken up. But all such legislation must carry an appropriation of some kind, because the experiment station, running on the Hatch fund, cannot undertake our police work with the use of those funds, else down at Washington they will be calling the director of your station up and asking, "What meaneth this?"

WHAT STATIONS SHOULD DO.

While the experiment station has a right to do all kinds of work which are of a public nature, it has only in a very limited degree the right to do work which is of a private or individual nature. Naturally, in connection with the fertilizer control we analyze a good many samples of fertilizers sent us by farmers, for their own knowledge. We are not asked by law to do this, and it is not our duty to do it, and if there was enough of that kind of work coming in to interfere with the regular work a line would have to be drawn.

There are various kinds of problems to be studied in agriculture, and in my opinion an experiment station has very little business to undertake the solution of problems which the farmer himself can solve. There are some investigations which a station might undertake which are simple and easy, as a variety test, for example. We may wish to know whether this variety or that variety of strawberry is better, this or that variety of apple. Now while an experiment station can do work like this for you, in my opinion it is not very valuable work. There are also field experiments, to ascertain the effect of this or that fertilizer. That is legitimate enough work for an experiment station, but rather low grade work, not very valuable work.

We can study problems connected with feeding, work that is instructive and valuable, but not the best kind. An experiment station should not confine its energies to work of that kind, it can undertake still higher problems to advantage. It is necessary that we find out, in the use of our cattle foods, how much of the nutrients is digested. These experiments are more complicated and more expensive, but you readily see their advantage. We want to study the fungous diseases and the injurious insects. You understand the need of those things, they are valuable and the station must do them.

ABSTRACT INVESTIGATIONS.

In my opinion the best work that experiment stations are doing is along the line of abstract inquiry. Sometimes if you go into an experiment station you will find that they are doing work which, no matter how much they try to explain it to you, you can not exactly understand. In the Connecticut station Dr. Osborne has for years been studying the nitrogenous constituents of different seeds and grains. That is a desirable thing to do. In Connecticut again, at the other station, they have been studying the bacteriology of milk and cream. And at that station they are making abstract experiments with the respiration calorimeter. That kind of work is valuable and necessary, and in my opinion the best kind of work. It was said here yesterday that it had been demonstrated that certain kinds of plants could acquire nitrogen from the air, the legumes. That work was begun in Middletown in 1881, and I am very certain that if any of the farmers that are present here could have seen all the fussiness of that work they might have said, "That is what you are here for, is it? Drawing good salaries and fooling away your time." And yet that kind of work was necessary in order for us to know that plants get nitrogen from the air. They had to grow in a soil which contained absolutely no nitrogen and in dishes which contained absolutely no nitrogen, to demonstrate this.

It would have seemed a little bit absurd to you, perhaps, if you had gone into the laboratory in Massachusetts and seen a man carefully studying and making measurements of the size of the mouth of a gipsy moth, and yet it was a very important thing, showing how necessary it is to know everything about the animal that we are to fight. They sprayed their trees with Paris green, and those fellows went along and ate up the leaves and did not die. Paris green is supposed to be a poison, and immediately the thought came that the dealers had fooled the commission, and sent them something that was not Paris green; but chemical examination showed that it was all right; and then by placing some of that Paris green under a microscope and measuring the diameter of the particles, it was found that the particles were bigger that the mouth of the gipsy moth, and he could not get the Paris green into his mouth no matter how much he ate the leaves. This difficulty was easily remedied by grinding the Paris green finer.

Here in our own State the study of the life history of the apple maggot (*Trypeta Pomonella*) which Prof. Harvey made, was necessary in order to know how to fight it. Prof. Harvey had to study it in all its relations, in all its life history, from the time when the fly lays the egg to its development in the apple. It was found that there was only one vulnerable point, and that was just after the apple had fallen and before the worm had a chance to crawl into the ground. The same thing is true of the currant worm, which goes into the fruit of the currant. So that a study of that kind, which is thorough, painstaking study, and which may seem to have no direct application, is among the important work which experiment stations are doing.

The study which Prof. Osborne is making of the protein of wheat, peas, beans, and other grains is necessary in order that we may get at a fundamental knowledge of the science of nutrition. Yesterday you had hung up before you some charts that you thought were complicated; they were the simplest kind that you can possibly get, because on them the nitrogen constituents were simply called protein, and when you speak of protein you cover a multitude of things, things that are very diverse. And yet to make it simple and easy to the comprehension they are all grouped together and called protein. We think when we commence to understand what protein is that we have got at the solution of the mystery, just as Mr. Huxley thought that protoplasm was the foundation of all life, and that it was a simple substance; but it was found that protoplasm is composed of dozens of different things. And so with this protein; it consists of large numbers of compounds. We have come to make a little bit of a classification, as albuminoid and non-albuminoid, but we must know more than that. We must know exactly what proteid we are talking about; and it is such investigations as those of Dr. Osborne, that do not seem to have any special bearing, that have the greatest value to us. They are equally important to Maine and to Germany. You will find this work being printed in German periodicals just as much as in American periodicals, simply because it is so important.

BACTERIA OF MILK.

The same thing is true in the study of bacteriology. When we began at the Storrs Station, nine years ago, to study the bacteriology of milk and cream, creamery men and farmers believed that the ripening of cream was merely the souring of the cream. And there were acid solutions in the market, lactic acid, etc., which people could buy and put into the sweet cream to prepare it for churning. But Dr. Conn's investigations, starting from work which had been done in Germany, very speedily showed that this fermentation was a very complicated thing,—that very minute plants assisted in it, and were indeed the chief factors, the active principles, in it. Dr. Conn went on studying pure culture after pure culture, getting this bacterium and that bacterium out by itself so that he could find out the different kinds that were in the milk, and whether they were in the milk as it came from the cow, or whether they were added afterwards. But before it was possible to make any practical application at all it was necessary to make a long extended series of investigations of a purely scientific nature, which would seem not to lead to practical results. He found that not only the souring of milk, but the ripening of cream was due to these organisms, and that some organisms affected the cream but very slightly, others gave a good flavor, and still others gave a bad flavor to butter. He found that bitter milk, which is a trouble at certain seasons of the year, is really caused by an organism instead of feed; that ropy milk is due to the same cause. During his investigations one of those incidents occurred which seem so exceedingly strange. He was hunting for a bacterium, which, put into cream from which all other organisms had been excluded, would make butter of a fine flavor, and he had been tolerably successful. But in 1893 I happened to be a judge of the food exhibit at the Chicago Exposition, and it became my duty to go over into the Uruguay section and look at some canned milk,—whole milk that had been canned—to see whether it should have an award or not. I tasted it, and it was the strongest, bitterest kind of milk that I ever tasted. It took three hours for the taste to get out of my mouth. In another part of the Exposition we had a bacteriological exhibit, and I carried two cans of the milk there and said to Mr. Estes that I wished he would make some cultures and see what organisms were present in that milk. He found there were four or five organisms that had escaped the sterilization, and one of those from Uruguay was found to give the finest flavor to butter of any organism which had ever been found and gotten out separately. It is now upon the market and is known as Bacillus 41, or Conn's Butter Culture. That is the way it came about. It was in a sense accidental, and yet, it could never have come about but for the years of painstaking study which preceded it.

THE RESPIRATION CALORIMETER.

We talk about the rations which animals should have,—"take 100 pounds of Class 1, and 100 pounds of Class 3, and mix together and feed six to eight quarts," as Dr. Lindsey told you yesterday; but we have got to get at this not by feeding experiments, but by finding out the needs of the animal. And in order to do that, what are called respiration experiments have been made. Take a box and place an animal in it and shut him in perfectly tight, and pump air into the box, analyzing the air when it goes in and when it comes out, and you get some idea of the respiratory products. Then we can analyze the food and the excrements and find out how much has been assimilated. But we have got to know a good deal more than that. Dr. Lindsey told you that the fat, and the starch, and the sugar are used to give energy and heat. We must get at the heat, and we have the calorimeter by which we measure fuel value. And we must know if the fuel value as measured outside of the animal corresponds at all with the heat produced in the animal. The station at Middletown has been working for three years on a respiration calorimeter. It consists of a copper box, with a wooden frame, surrounded by a zinc box, an air space, a wooden wall, another air space, and another set of wooden walls. It was so constructed as to shut off the animal from the heat of the outside air. A complicated series of experiments were carried on, whereby it was possible to measure one ten-thousandth of a degree of heat, and a painstaking analysis was made of all the air which went into the box, and a system of cold water arranged to carry off the heat. These experiments involved a large amount of complicated apparatus, which I could not make clear to you without drawings, and an enormous amount of work. It takes twelve men to handle that apparatus. This has been going on for three years, and no results have been obtained yet which can be dignified by

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the name of results. And yet that work, which is of such an abstract nature, is the kind of work that experiment stations must do in order to get at the fundamental problems which underlie feeding. I believe that the stations which are doing this abstract research, are the stations which are doing the best kind of work for agriculture.

Sometimes men will say, "Why don't you plant a tree and watch its growth, and see what the effect of certain treatment is?" My reply is, "You can plant it just as well as we can. You can try those things just as well as we." The function of an experiment station, that which will give the most to agriculture, is not to do the things which farmers can do themselves, but to try to solve the problems which the ordinary farmer, unaided, could not solve at all. We do not begin to realize the value of this abstract inquiry. The station at Middletown may absolutely fail in that experiment with the calorimeter, and "All that money will be thrown away" you will say. It has not been thrown away, because the failure of getting at the problem from that side will lead men to get at it from another side; we must solve these problems which underlie practical agriculture. If the eye had the power to follow the food as it passes into the stomach and becomes digested; passes into the circulation and becomes assimilated, and thus becomes a part of the body; and is finally broken down and excreted by the kidneys, the lungs and other organs, we would not need to have such experiments. But we must get at these things by complicated investigations, and that, in my opinion, is the kind of work that the experiment stations are doing which in the long run will count for the most.

CATTLE FEEDING.

Now, have the experiment stations accomplished anything along the line of the dairy industry? I want to submit a few things. We have learned, among other things, pretty clearly what the function of food is, and what the functions of the different classes of nutrients are. This came from slow, painstaking investigation. Liebig paved the way. He made certain suggestions as to the use of food, and, with one notable exception, his suggestions were very good. He made a mistake as to the value of protein, but that has been corrected. Now, in regard to the function of food, Why is it that we feed certain kinds of food? We fed hay, and then we commenced to feed corn meal; and then we commenced to study the composition of feeding stuffs, and we found that the reason why sawdust was not a food and bran was, was that sawdust did not have certain nutrients in it, and bran did. And the chemist found out that all of these things which we use for food contain certain great classes of substances which we have grouped together as protein, as fats, as carbohydrates. So that fundamental knowledge which came to us was very important. The next thing which the experiment stations have given us, along feeding lines, is a knowledge of the digestibility of foods. We have found that some things are much more valuable as foods than others, and following along this line we have made observations to get at what animals require. We do not know yet the exact physiological requirement of the milch cow, we may never know it, but we know approximately; and from this approximate knowledge we can formulate rations, and find out how much of this and that feeding stuff it is necessary to plant to make a proper food for our animals. The same work has been done along the line of breeding, but our breeding has been for the most part rather a haphazard thing. The only line in which we have made a decided success is that of the trotting horse, and you will find more monuments of mistakes than of success along that line, because with all of our intelligence, and with all of the knowledge that was available, men have gone at it blindly. So, in the breeding of dairy stock, we got to breeding for color and for a tail without respect to what we got in the milk pail. Now we are trying to get at milk production, and the experiment stations have guided in the direction in which breeding should be done.

THE COMPOSITION AND HANDLING OF MILK.

In regard to ascertaining the composition of milk, the experiment stations have been of infinite value to the dairy industry. The Babcock test, showing how much butter fat milk contains, is a great acquisition.

In milk handling the stations have brought out very much; also in the method of buying cream, the paying by the butter fat content. Now, while here and there you find a man who still stands out, and says that the space of cream is all that he cares to know about, most men know that the Babcock test alone can tell what the cream contains. And while the Cooley system was a great advance over buying milk by the pound, it is fully as great an advance to buy butter fat by the pound.

We have found in connection with this bacteriology that it is the bacteria that prevent the milk from keeping, and so there has come in the idea of cleanliness, not from the housewife's standpoint, but from the standpoint of the biologist. So that the thing which the housewife considered clean is found to be foul. The housewife thought that after she had carefully scalded her pans, if she wiped them dry she had done the proper thing. The biologist showed that when she wiped them with her dish towel she was adding dirt, biological dirt—bacteria—and if she wanted to do the washing rightly she must wash the dish and treat it with steam, and not contaminate it by putting a dish towel upon it. The housewife's, the biologist's and the chemist's ideas of cleanliness are exceedingly different, and for the interest of dairying the biologist's idea of cleanliness must prevail.

We have learned that cream, if taken under the very best of conditions, will keep a very long time, because the fermenting organisms are there only in small numbers. We have also found out from the study of the life history of bacteria why it is advantageous to cool milk to a low temperature, since bacteria do not flourish at that temperature. Then we found out about the pasteurization of milk. We know that if we heat milk to the boiling point, where it will sterilize, the milk has the boiled milk taste. Then that which was suggested by Pasteur, and is called pasteurization, came into vogue, in which it was found that if milk was heated up to a point in which it would not get the scalded taste, practically all of the bacteria would be killed; that is, if it were heated to about 155 to 160 degrees F. All these things in connection with milk handling, butter making, and the ripening of cream have come from the experiment stations. And I believe that the ripening of cream is a wonderfully important thing for us here in this State, and that we are only on the threshold of it. We must learn to handle our cream better, to be more careful in its separation, more careful in its transit in the cream cart, and that it shall get to the creamery in good condition. I think that our butter makers have got to learn to inoculate their cream. Many of them are inoculating, either with a boughten culture, or one which they have prepared.

In cheese making there is a wide field for investigation. A chemical study of the bacteriological changes which take place in cheese has not been made to any extent. One of the most famous kinds of Swiss cheese is made to-day just as it was made by accident. A Swiss shepherd was out with his lunch, and had some bread and cheese left. He put the bread and the cheese under a rock, and went back and found it after two or three weeks, and found that it was such cheese as he never had tasted before. Se he put more under a rock, and to-day that cheese is manufactured in that crude method. But just as soon as men have their attention turned to the study of the bacteriology of cheese they will find what germ it is that produces this flavor, and they will manufacture this cheese by the use of the proper culture. Our ripening of cheese is largely accidental. It is going to become scientific and careful just as soon as we have made anything like as complete a study of the bacteriology of cheese as we have of the bacteriology of butter.

EXPERIMENT STATION PUBLICATIONS.

Perhaps I have talked about as long as I ought to talk. But there is one other thing that I do want to call your attention to, and that is the publications of the experiment stations. Twenty-five years ago there were very few books upon agriculture, and those that were published were often as misleading as the cook books of the time. To-day there is a wonderful agricultural literature, very rich and full, and almost all of it can be had by any man in this country by simply asking for it. Every experiment station, under the Hatch Act, is required to issue bulletins and reports of its work. Most of you that are here probably receive the publications of our own Experiment Station. Those who do not, simply give me your names, or send to the Experiment Station, and you will get the publications of that Station. And the Station in this State has done good work.

It has published valuable bulletins, and its annual reports are of much value to those that are able to follow them. The annual reports are much more technical and require much more knowledge, but the bulletins are intended to be put in easy, simple language. Then there is the report of the Secretary of the State Board of Agriculture, which contains an outline of all such meetings as this, together with other matter of interest. It has bound up with it also the report of the Experiment Station. Those publications are available to every citizen in this State simply for the asking. Every station in the country is issuing similar publications to those of your own Station, and for the most part you can get them by simply sending your names. And there is the Department of Agriculture at Washington. We used to speak of it as a seed bureau, but it is a great, noble, scientific institution, second to none in the world, and they are issuing popular publications as well as scientific publications. Some of those publications you can obtain by applying to the Secretary of Agriculture, others you can only get through your congressman, or by sending the cost of printing. By sending to the Secretary of Agriculture you can get a list of everything that is issued each month, and the price, and you can send to your congressman or to the Secretary of Agriculture, enclosing two, three, or five cents, whatever the bulletin happens to cost, and you will obtain it.

MONEY NOT EVERYTHING.

I said last night that the man who would be a successful agriculturist must work, and work hard, and he must work harder with his brain than with his hands. Brain work is hard work, but it is the work which brings its reward, both in measure and in merit.

Young Mr. Levi thought that he had fallen in love with Mr. Goldenstein's daughter, and he went to Mr. Goldenstein and said, "Mr. Goldenstein, I loves your daughter Rachel very much; now I wants to know if Rachel vas to marry how much money you gives mit her, how much the dower is." "Oh! Rachel, she vas my youngest daughter, she vas only eighteen. I should give mit her only five tousand tollars. But there is my daughter Rebecca, she vas twenty-two years old, and if Rebecca vas to get married I should give mit her ten tousand tollars. And den there is my daughter Sarah, she vas twenty-six years old. If Sarah vas to get married I should give mit her twenty-five tousand tollars. And den there is Leah, she vas thirty-five years old, and if Leah vas to get married I should give mit her fifty tousand tollars." "I say, Mr. Goldenstein, haven't you some daughter that is about fifty years old?"

Now we are about to make the same mistake that the young man was going to make, and that is, to sell all that we hold dear in this world for the sake of getting a dollar, possibly a silver dollar at that. Agriculture is not worth anything to a man, in my opinion, if he is working in it merely to get a living, and is not trying for anything higher. What we want to do upon our farms, if we are going to be successful agriculturists, is at the same time to be intelligent men and women, good, earnest, honest men and women. We want to set our standard high, and we want to work towards it. We want to put just as much time into the development of ourselves as we possibly can. We need to put more time into the development of ourselves than we do into the development and breeding of milch cows. How are we going to do work of that kind? Many of us are getting too old. Like most things that are new, they have got to come through the younger generation.

EDUCATION FOR FARMERS' BOYS AND GIRLS.

We want to give our boys and girls just as good an education as we possibly can. The boys and girls do not understand these things; from their standpoint education seems to be a bore. You want to make education just as interesting as you possibly can. Keep them in the ordinary schools just as long as you can, put them in the high school or academy if you can send them, and then if possible send them to a college. And the best college is none too good for the farmer's boys and the farmer's girls. You may be taking them away from the farm, but it does not make so much difference. You want to educate them, to make them men and women that shall be a help to the world, that shall help their brothers, and help their neighbors; and the only way to do that is to give them just as good an education as you can. If you can possibly afford the money and the time, I do not think that the best college education is a bit too much for your boy or your girl; because life is infinitely more than the bread that we earn. We have got to put something else into it, we have got to get something else out of it.

THE STATE COLLEGE AT ORONO.

I want to call your attention to the fact that twenty-five years before Mr. Hatch introduced the Hatch Bill, Mr. Morrill, the venerable senator from Vermont, introduced the Morrill Act, whereby the Land Grant Colleges were established, and later on that endowment was increased, and the Maine State College at Orono was established. That college is a State college. It was founded by the people, and is for the people. The cost of obtaining an education there is simply the living expenses; you pay no tuition. Some people say that we do not want charitable schools. We have State schools all the way up to the College; and why should not we have a State College or a State University? It is simply the fitting top stone to our educational system. That College was established for the study of the sciences which pertain to agriculture and the mechanic arts, and these sciences are taught at Orono in a wonderfully good way. There are courses in engineering, courses in general science, in agriculture, and in electrical engineering. Let your boys and girls go there. Let them decide what courses they will take, and keep them there for the four years if you can. If a young man has decided that he wants to be a farmer, and thinks that he cannot give the four years', let him take the two years' or the one year's course.

I want to say a word about the teaching of agriculture. We have an idea that when we study agriculture we must study how to hoe, how to run the mowing machine, etc. While that is the art of agriculture, that is not the way to study agriculture. Agriculture is founded upon the sciences, and a person must first study science. You have got to study chemistry itself long before you can study the chemistry of the feeding of animals. Long before you can study horticulture you must study the principles which underlie horticulture, botany itself.

If you should examine our agricultural courses you might say that there was not a great deal of agriculture in them. We teach the sciences as they are related to agriculture, and use agricultural illustrations. We do not attempt to teach book agriculture as such, directly. In the two years' course you get relatively more of the direct work, and in the one year's course you get much more of the work, and comparatively little of the broad foundation studies. We are making greater efforts for students in agriculture than in any other department, because the boys and the girls take advantage of the engineering course, and courses of that kind, and our farmer boys do not take advantage of the agricultural courses as they might. We have a four years', a two years', and a one year's course, and if that were not enough, we try to reach the young men that are going to be farmers, and who have been on the farm long enough to know that they need some key to this great agricultural literature, with our six weeks' course in agriculture, which commences this year January 5th.

Let us try to get together, let us try to study our topic, our subject of agriculture, let us try to be just as noble men and women as we can; let us understand that when we try to work on the farm we are doing something more than tilling the soil, that it is an ennobling art, and if we will truly and honestly follow it we shall be a blessing to the world as well as to ourselves.

THE FUTURE OF NEW ENGLAND AGRICULTURE.

By GEORGE W. ATHERTON, LL. D., President of Pennsylvania State College.

Mr. President, Ladies and Gentlemen:

Of course you will not expect me to undertake to prophesy. I have no gift of prophecy, but I have as much as anyone else. The only way in which we can judge anything of the future is by observing the conditions which have existed and which do now exist, and out of them trying to obtain some intelligent view of the direction in which certain forces are at work. If you were to ask, for instance, what is to be the future destiny of the United States, no man could tell; and yet he could say, there are certain great forces at work which must result in certain great consequences, in certain great changes in our civilization. And whether those changes will be for the better or for the worse will depend largely, of course, upon his point of view.

Now with regard to agriculture, there is one thing as a starting point that I think we shall all very readily perceive and agree in, and that is that agriculture depends upon two great factors, man and nature. Nature is constant. The same sun shines year in and year out, the seasons come and go, the rains and dews fall, the vitalizing forces of nature do their work and change seed time into harvest; and out of all this round of activities that we cannot control comes the whole of the result that we have to depend upon as agriculturists. I say that we all have to depend upon, because the food we eat and the raw material which enters into all our manufactures have to be extracted from the ground; and the great primary industries are therefore properly called the extracting industries. Mining, fisheries, and agriculture, are all extracting something from the resources which nature has stored up for us. The seasons vary somewhat, of course. You will have late frosts sometimes, and have to do your planting over again, and perhaps it is too late to get a crop that year. You have an early frost, sometimes, which injures the crop, and a long, hard winter; and you use up all the fodder and have to buy more, and the ends do not meet for the year. And thus there will be incidental variations; but taking year in and year out, decade after decade, the course of nature moves on; so that in trying to understand what the future of agriculture is to be we can leave nature out of the question, and say: What has been, will be.

I sometimes think when I am speaking to audiences—and I think I am not exaggerating, and that gentlemen here, and perhaps ladies, who have spoken to audiences and have observed audiences will bear me out—that there is between the most untrained intelligence and the most highly trained intelligence in a good audience a wide difference. There is even a difference of centuries in the same audience. Every one perceives that change which goes on within one's self, so that while our years return and we cannot tell, as a rule, when any great changes take place in ourselves, unless they are monumental, yet we know that we are different from what we were last year, and the year before. And so each year goes on bringing changes, and we look at nature with new eyes. But man as a collective body changes even more than the individual, because when we bring men together in a collective body there is a kind of vast sweep of things which carries all on, beyond our own power and control. And the whole of advancement in the world, in the past, and in the present, and in the future, has been and will be a reaction, so to speak, the action of one upon the other, of man, the individual, upon society, and of society upon man, and of these two upon nature, and nature upon them. In modern times we hear a great deal about environment as affecting the individual character, and the collective character—the race. And environment is a vast power. It is a controlling and shaping influence on the destiny of whole nations. The nation, for example, that lives on the sea, around the sea, whose every coast is washed by the sea, like Italy, or like the British Islands of to-day, must be influenced by that fact, and they will be a sea-faring people.

We may start, then, in considering agriculture for the future, with this idea, that the changes which have been wrought in agriculture have been wrought by man; not the individual man, but the collective man, the organized society of men. And the changes that are to be wrought in the future will be wrought by man, collective man more than the individual man, of course. Now, as I take it, there have been certain great and powerful influences at work in the United States ever since we were first a nation which are still at work and which lie at the very foundation of this whole question. Let me call your attention to two or three of them as briefly as I can.

One is the tendency of people all over the civilized world to gather in cities and large towns. We recognize that, and yet I doubt very much if we fully appreciate the force of that sweep of tendency. When our first census was taken, in 1790, for instance, how many towns or cities do you suppose there were in the United States that had a population of 8,000 people. Some of you doubtless have observed. There were just six in all the United States, and these held 3.35 per cent of the population; that is, about one-thirtieth of the population of that day lived in towns of 8,000 people and upwards. In 1880 there were 286 such cities, and in 1890 there were 486. And instead of 3.35 per cent, when the census of 1890 was taken nearly one-third of our people were living in such towns—30.39 per cent. In 1870 there were 14 cities in the United States with 100,000 people and upwards, and in 1890 there were 28 of those cities. In 1880, again, there was one city that had a million people in it—that was New York. In 1890 there were three such cities, New York, Chicago and Philadelphia. These facts show in a most striking way what I mean by the drift of population toward the large centres. And a fact of that kind, taking place not only in the United States but all over the civilized world, has a meaning, of course. It has it causes, its roots, somewhere in the conditions under which men are living.

Now there is another fact running right alongside by side with that, and that is the fact that this century has been a century of invention, a century of mechanical inventions, of an increased invention of machinery and the application of it to all the uses of life. And what does that mean? Every mechanical contrivance is an arrangement for taking the burdens off from the shoulders of man and putting them onto the shoulders of nature. Every machine is a harness, in which we harness up the forces of nature and make them do the work of man. And taking agriculture alone, we find that while the population of the country has more than doubled since 1860, it takes ten per cent less men to do the work of raising the crops. It takes ten per cent less men to raise the crops for double the population, with all our exports in addition, that it did 30 or 40 years ago. It means man let loose from the employment of raising the raw product, and necessarily driven to some other employment, and so this vast increase of mechanical employment has been going on side by side with this concentration of population in the cities. And thus you have this great group of movements all interwoven,—the drift of population toward the cities, the increase of the invention and use of machinery, the diversification of industries, the division of labor; and all of these are parts of that great transition through which the world is passing over from the dullness and lethargy of mediaevalism into the energy and life and spirit, the forward and upward push, of modern times. Nothing especially to complain of, but a thing to observe, as having its causes somewhere.

Now there has a third great movement been going on in this country, for the last 50 years especially, and that is a movement for opening the Great West, as it used to be called. A short time ago, in my boyhood, men talked of the West as anything beyond the Alleghany Mountains. Now go into the state of Ohio, or Indiana, or Missouri, and they talk to you there about the West. They do not think of themselves as the West, they are not the West. The centre of population in 1890 was in southern Indiana, but when the first census was taken it was just south of the city of Baltimore. All our population occupied this narrow strip between the Alleghanies and the Rocky Mountains, and down the coast into Florida and a very little of Florida. The centre of population has gone steadily westward with every decade, until now it is in southern Indiana, and moving steadily westward. It means that the vast unknown, that vast West, has been opened to cultivation. Vast tides of population have been flowing in there, not only from this country but from the old world. The choicest men of our race have been taking up and subduing that new West. With what result? Within the last 30 years they have added more than two millions of farms to the United States under the Homestead Law alone, and a half million more under the Timber Act. And those two and one-half millions of farms have been given by the United States Government to the people who have gone there. No wonder they raised large crops. They simply raised on the same land, year after year, crop after crop. Of course that process will stop after a while, but we are feeling the effect, and the transportation of freight has been reduced to the almost incredibly low figure of one cent per ton per mile. A ton of freight can be carried a mile for one cent; and this is flooding the markets of the East with the meat and food products of the West. And last year our agricultural exports alone amounted to $570,000,000 and upward.

New England and New England farmers cannot compete with the drifting away of population into the cities, with the increase of manufacturing industries of every kind, and with the opening of these vast fields of the West. All these busy hives of industry the farmer of New England cannot compete with in the same field. Can he compete at all? I think he can. I think he can compete, not directly, but indirectly. This very tendency to drift into the cities and into manufactures is a tendency which shows that shrewd men find they can make more money, and money seems to be the one thing. Before I get through I hope I shall be able to indicate that money is not all. "Man shall not live by bread alone," the Word says. Man shall not live by money alone, nor does money represent everything. But when we find that a certain amount of money will get for us here in Skowhegan the good things we desire, we infer that the same amount of money will get for us the same amount of good things somewhere else. And that is just where a great many of our young people get cheated. There has been in Maine during the last ten years a loss of population in the rural districts of 24,391, by the census, and yet the population of the State increased during that same decade 12,150, just about half as much. This means that the population of the cities was increased by 36,541. The population of the State increasing at that small rate leaves more room for the readjustment of the population than would be true under some other conditions, and Maine is to my mind a typical, representative state. The population here, for instance, living in cities and towns of 8,000 and upwards, is just under 20 per cent; if I remember rightly, 19.72. That, of course, leaves out of view the large and important number of people that live in towns of from one to five thousand, which are the little nerve centers for great regions of country, where there is going on all the while the hum of manufacturing industry, fed from the farms, and the farmers in turn finding that these are their best markets, and adapting themselves to these markets.

Now is it desirable that men should stay on the farm when they can get larger returns elsewhere? I do not see any reason why they should. There comes a third point, which we must all recognize, I think. It is a real, serious hardship to some men, and women especially, and sometimes to children, to leave their homes. That is to say, to change your occupation is one thing that makes sort of a wrench inside, but to change your place of abode is a much more serious thing. Your children change their place of schooling, your family changes its place of religious worship, you change your neighborhood associations, you are like a stranger in a strange land. If you go to a new place you have to strike roots again, and the process of pulling up roots is so hard that many people never survive the shock. It is, perhaps, an injury to all those who have to go through it. So that to that extent it is a great hardship for anyone to change his accustomed place of abode. On the other hand it is a great advantage if by changing places you can make enough to compensate for all this loss and put yourself in a better condition, and put your children in a better condition.

Now I have dwelt upon this for the sake of showing you as clearly as I can that we are in the midst of the operation of forces which we cannot control. They are forces that are made by collective society about us. We cannot stop the tendencies of the age any more than we can stop the waters from pouring over the crest of Niagara. That is their predestined course. Men love the city, and the city is the home of great achievements, of great industries, of great charities, of great activities of every kind. But many a boy and girl imagines because there is a great mass of wealth and prosperity there, that everybody is wealthy and prosperous, and there is where he makes the fatal mistake. Many a young man and woman goes to the city with profit and great advantage, finding better opportunities for cultivation in various ways; better opportunities for music and art, better libraries, better society and companionship, and finds some of the wants of the nature satisfied. But the cities are full of temptations for the unprepared. They are full of snares for the unwary, and they are full of ruin for the weaklings. In that sharp and pitiless competition that goes on in every large city the weaklings are all the while trampled under foot, just as when the cry of fire is raised in a crowded audience and everybody rushes to the door, men, women and children go down under the foot of the stronger. It is precisely so in the competition of the great cities, they consume human life at a fearful rate, and if they were not constantly recruited from the country districts they would soon go into decay. And so the city is drawing all the while from the fresh blood and fresh life of the country. That is the order of nature, and I do not complain of it, but I mention it here because the young people of the country ought to be taught that there is no place so secure and which offers them so much promise of happiness as a good country home.

Now if I were to ask you I think you would agree with me in saying that there are certain conditions of success for the farmer under the circumstances in which we live. And first of all I would place the love of the soil. I know what I am talking about because I have worked on farms myself in New England, and I had no other ambition than to work on a farm until circumstances seemed to lead me in another direction without any seeking of my own. I loved the farm. I never thought it a hardship to work from sunrise to sunset, and many a time before and after, when I was in the young and fresh vigor of my boyhood. I say the farmer, in order to succeed, must love the soil and love his occupation, and he must feel just as men in other callings do, that he has some especial fitness for it. You go into a city and you will find a vast process of selection going on all the while. Some men go into the railroad business, some into the dry goods business, some into the wholesale grocery business, one goes into this thing another into that, and so industries are specimens and examples of the selection of the fittest man to do the fittest things. They illustrate the doctrine of the survival of the fittest in every branch. The farmer must do the same thing. He has got to be subjected to the same kind of tests, and he must pride himself in his occupation; I do not mean with a vain boastfulness, but he must have a sincere pride in being a farmer; he must catch something of the inspiration of his surroundings. There is no man, among all men, so favored.

I was talking with a young man who had taken a tramp through the White Mountains, and he told me that as he got up one morning the inn-keeper said to him, "I had a great mind to call you in the night. I have been up at all times of the night all my life (he was on a stage route) but I never saw such a sight as I saw last night. The Aurora filled the whole northern sky and swept up to the zenith and made it almost as light as day." He found later that telegraph messages had been sent from Boston to Portland by the free electricity in the atmosphere, it was so overflowing, so surcharging. The man who lives out under the open dome of nature sees that and other things equally inspiring though perhaps not so striking, all the time; and if he goes out under the starry sky at night and thinks, as the African shepherd of whom I have read, of that vast and majestic procession, never ending, by which the planets move on in their courses; if he watches the form and motion of the clouds and remembers that they are also subject to the same all-embracing law which controls the planets in their majestic movements; if he looks at the soil and studies to see how vast and almost limitless its possibilities are, and how responsive it is to treatment; if he studies the laws of life in the plants and animals around him; if he sees how all nature thrills with ever fresh life; he can but feel that he is standing on the very threshold of the secrets of nature, that he is reading those secrets, that he is feeling almost heart to heart the throb of nature, as no other man can. And if a farmer goes about his work with that spirit, I mean if he feels how grand a thing it is to be in touch with nature, don't you suppose the children in that homestead would grow up with something of loyalty and love for the home, don't you suppose they would feel what a grand and noble thing it is to have this opportunity for learning of nature at first hand every day and hour of all their lives? Don't you suppose they will themselves wish to become the best farmers, whether inside of the house or outside of the house? And don't you think that all that will be an inspiration which will make the country home something of what it ought to be? I am sure it must be so.

Then, again, I would say the farmer must be a good business man. It used to be thought that farmers could be made of anything. I know that was why they tried to make a farmer of me. They used to think that all you had to have was the dullest sort of a boy, and put a scythe in his hand (for much of the mowing was done by hand then) to make a farmer. You could pick out any fellow and set him at work and he would go on in that tread-mill routine and would be just as good a farmer as anybody else. But that time has passed. The time has come when farming must be conducted on a business basis, like any other business. The farmer who sends goods to market, whether dairy products, potatoes, apples or small fruits, has got to send them in the best possible shape, put up in neat, attractive packages, and put up so sound and good that any label from his farm is a guarantee that the goods will go straight to the best class of purchasers. Many a farmer is doing precisely that sort of thing, by putting the same care, intelligence, and forethought into preparing his product for market as is done by the most careful and accomplished business men in other employments. In order to do this the farmer must, of course, keep himself well informed. He must keep himself well informed by means of just such meetings as this, Mr. President. He will be a man who attends just as many as possible of the agricultural and horticultural organizations. He will not come and stay a little while and then go out to get fresh air and talk politics, but he will stay and listen, and respond. He will take his part in the proceedings, he will tell what he knows. And many and many a time you will hear a plain, uncultured, untrained man tell you out of the results of his own sound judgment and sound, clear observation, and long experience, things that you get in none of the books, and that are of great importance to all his neighbors.

Then there is another field of information. Throughout the United States, as you know, there are agricultural experiment stations maintained by the government of the United States. You have one of the best of them at Orono. These stations are maintained by the government of the United States for the sake of helping the farmer to answer his questions, because it takes years of preparation to be able to solve the problems that confront the farmer. You must have your appliances gathered around you, you must understand, as it were, the secret processes of nature so that you can chase her up into her hiding place and wring her secrets from her; and trained men are doing these things all the while. They are investigating the diseases of plants and animals, the laws by which they live, and many other subjects. All this they are doing all over the United States, and the government is spending something like one million of dollars every year for the purpose of helping the farmer to obtain the information which he cannot himself obtain. You can get not only these bulletins and reports from your own Experiment Station, freely for the asking, but you can get them from any other part of the United States, in almost every instance. If a farmer finds that in North Carolina they have been pursuing some particular line of investigation in which he is interested he writes and gets a bulletin. That exchange of bulletins is going on all over the country, and it is doing more to revolutionize the whole business of agriculture than all that had ever been done for the advance of scientific agriculture in all the years preceding the last ten years, in which that process has been going on. For only about half a dozen stations were established previous to 1887.

Then there is another way of helping farmers,—and when I speak of helping now I mean not helping them like paupers but helping them to help themselves,— and that is in the maintenance of what are known as short courses of agricultural instruction. A great many of the states have established these short courses in connection with their state colleges. The courses are made up of lectures on practical, every day topics pertaining to farm practice and farm science. The lectures are given by men who have had practical and successful experience. For instance, we had a short course in connection with the College that I am connected with, and employed a man to speak on some special branches of dairying in which he had had special and successful experience; and we brought him from the state of Illinois to give that instruction there for six weeks. We had another man from New York giving special instruction in a line of fruit raising in which he had been especially successful, and we have that man employed in the farmers' institutes, another field of activity. Those courses are thrown open to all. It seems like a fable, and it created a great deal of interest at the time,—we had in one of our short courses a gentleman who had held high public office, a man over fifty years of age. He went like any boy, and took notes carefully, and he has said to me and to others that he would not give up that experience for any consideration. Sitting right beside him on the benches were young men from eighteen to twenty years of age. These students were admitted without any examination and subjected to no tests, simply allowed to get all they could out of the instruction. You will say that this is a poor method, and I had something of a feeling of that sort myself. But I have talked with the teachers, and I have not found one of them who has not said that he was surprised and delighted at the eagerness, and readiness, and success, with which these minds, untrained to regular habits of study, grasped the essentials of all their teaching. And the teachers were obliged to put in their very best work to keep up with the questions that these bright and active minds would ask of them. I know of two cases where employees of a creamery were sent to us, the employer paying the expenses, for the purpose of getting the benefit of that instruction, and the men felt repaid in a single year for the little expenditure they had made in that way.

Then farmers' institutes are being conducted now on a very broad and intelligent plan. We have in Pennsylvania three series of farmers' institutes going on, covering the whole state, a systematic course laid out, and we have what I think is an advantage over anything I have seen elsewhere, two regular men for every institute, making six in the field all the time, two who are at every institute teaching their specialties, and besides we have local help. These specialties are confined to a few of the important things which all farmers are asking about—education for themselves and their children, certain questions about the carrying on of their farms, and certain other large questions, one especially, the question of good roads.

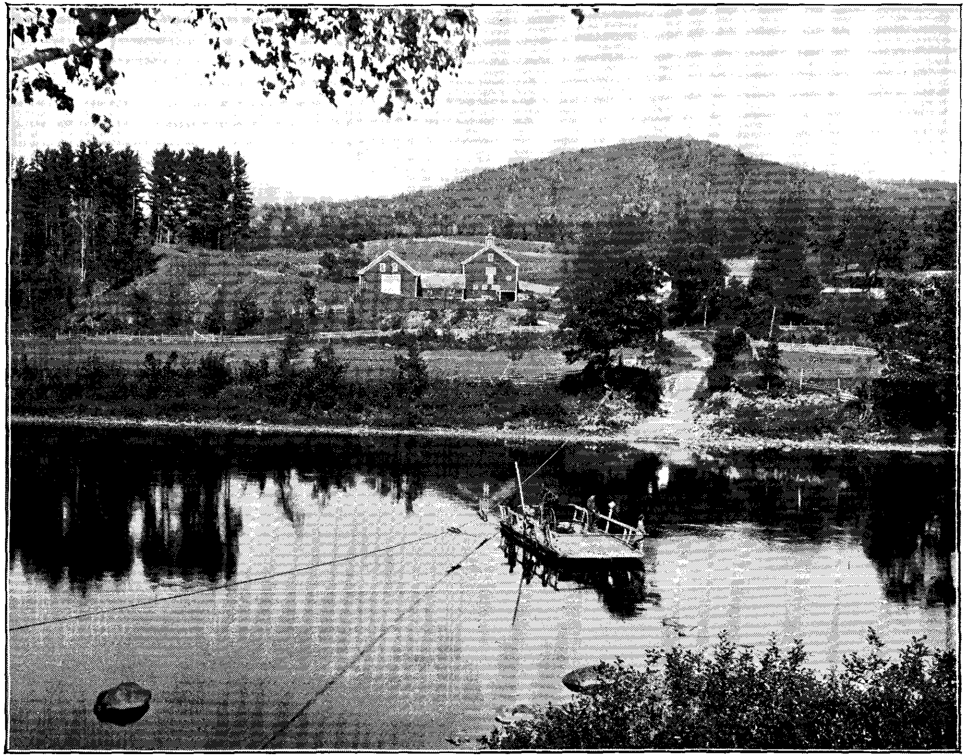
Now all these means of information, all these means of teaching farmers how to make the most of their soil are secondary and auxiliary, but they are of very great importance. They are secondary because unless a farmer will take them up himself and utilize them himself, and then put his common sense at work, of course they will do him no good. And when I say he must put his common sense at work I mean that the farmer has got to stand the same test as every other man. No man expects to go into business communities and succeed unless he is careful, diligent, attentive and patient, and those qualities always give success. But carelessness, or indifference, or ignorance of one's business, or laziness, will not win, on the farm or off the farm. They are things which are against the order of God's Providence. He never meant them to win. He meant this world to be a place of struggle, and He meant that we should make our conquests by means of victorious struggle.

I want to say another word on this subject of agricultural education for the children. I have spoken of the importance of making the home attractive and making the children feel that it is a beautiful thing to live on a farm. What is a man doing in this world, what has he always been doing, except trying to find out nature? The very best measure of the advance of civilization is the degree of man's knowledge of nature, her forces, her laws of working; so that he can control and utilize those forces and laws. The child on the farm stands in the midst of it, he stands there at a time when all his faculties are eager and alert, hungering and thirsting for knowledge. There is nothing in this world so curious as a child, as many a father and mother who have tried to answer a child's questions, understand. How many times they say, "O, go away," because they cannot answer. A child is a born interrogation point, and keeps on interrogating all the while, if it is an active, sensible child, and it is the business of one generation to answer the questions of the next. Now the child, at the time when all its faculties are alert and active, goes to school, and what does it get there? I know what I got there, and I know what I gave others there when I began my apprenticeship. He gets a kind of treadmill routine of the same thing. I went to a teacher and wanted to study a subject, and the teacher said, "That is no good" and I found out afterwards that the teacher did not know it. I have known many a boy to go to school this winter and be put back in his arithmetic where he was last winter, because the teacher told him it "would be a good thing to review." And so he goes on reviewing, that is, keeping himself within the limits of the capacity of his teacher, year after year. It is not always so, thank God, but there is too much of that kind of sham pretence of teaching.

I would have in every school in the rural districts teachers who are the very choicest and most select of all teachers. And if necessary, let some system be adopted by which there shall be State aid for all this. I would have them trained in the knowledge of all the facts and principles of natural history and natural science,—botany, chemistry, physics; for here is nature teeming with an abundance of knowledge and the child eager to learn, and no one to teach. There is no so wicked waste of time as that which is spent in the primary district schools in going over and over and over the same things, that can be learned by the child himself after the first processes have been learned. But I would not exclude them. I know I shall be thought guilty of heresy by many. Perhaps some teachers here are ready to burn me at the stake. They say, teach literature. I say, teach literature. Among the greatest possessions of the human race are the great master pieces, the master pieces which are, as Milton says, "The choicest expression of the life of a great soul." And I think the longer we live the more we appreciate what great literature does for the race; how Homer, and Plato, and Aristotle, and Chaucer, and Shakespeare, and all the rest, have entered into the very fiber of our intellectual and moral being. But I would have the child understand that the greatest of all masters have always been those who kept closest to the heart of nature, and that the whole business of teaching is to find out and disclose what nature is, not merely external, but internal nature, the nature of the intellect, of the soul, of all these faculties and aspirations which move the human race. Teach the child to observe carefully and then to state accurately what it has observed, and you have taken the fundamental step which lies at the beginning, continues through the whole process, and comes out at the end of all education. For is not education just that,—to teach the mind to see clearly and then to go by right steps from right premises to right conclusions? The mind that can do that has learned the whole process of investigation.

Abraham Lincoln had once been delivering an address, and at the close the Rev. Dr. Gulliver, who was the pastor of Governor Buckingham, the great war governor, was introduced to him and rode with him on the train. Dr. Gulliver said, "Mr. Lincoln, I do not want to be inquisitive or intrusive, but I would like to know how you learned to use the English language as you can. You know that Abraham Lincoln, after he became a man, never uttered a sentence that any man who knows the English language could not understand, because he thought clearly and he expressed himself clearly. He said, "I do not know, I never thought of that, but here is a little incident in my experience that perhaps will throw some light upon it. After I began to study law I came across the word "demonstration" all the while. I asked myself, What is the difference between demonstration and any other kind of proof or evidence? I could not make out. I went to the dictionary, and I could not make out. I asked my instructor in law and I could not make out. I could not get any clear idea. Finally I said to myself, 'Abe, if you don't know what demonstration is you will never make a lawyer,' and I put my law books away and went home and studied Euclid for six months until I could demonstrate every theorem at sight and then I thought I knew what demonstration meant." You know that at Gettysburg Everett made a long and eloquent speech and that the speech of Lincoln was condensed into a few close sentences. But, while Everett's speech is not read by one in a million, Lincoln's speech is read over and over again, and will be read as long as the English language endures; yes, as long as humanity endures that speech of Abraham Lincoln, which breathes the very highest ideas of loyalty, and patriotism, and Christianity, and the broad, Catholic spirit, will be read and re-read, and sink into the hearts of generation after generation. Lincoln never could have made that speech if he had not learned to think clearly and then to express clearly what he thought. And so the very beginning, and middle, and end, of all education lies just there, and I would have our rural schools hold fast to that one principle. I would have them begin by teaching the observation of nature, and a statement of the facts of nature.

Now what has this to do with the future of agriculture in New England? To my mind it has everything to do with it. The agriculture of New England has got to adjust itself to the conditions that exist, not by mere brute force but by trained intelligence. The men of New England have always stood in the forefront of every movement in which this country has been engaged. I will not say that New England is always the brain of the country, but I say it is among the best brain of the United States, and I say that New England is coming more and more to show that in her manufactures, in her commerce, in her agriculture, she is holding her own in the very front rank of the race of life, simply because she is more and more training, and beginning with the earliest childhood to train her own people for the duties of their life. I do not need to dwell upon the importance of training for patriotism. New England has always known what patriotism is. Our ancestors came here out of their devotion to liberty, and we have always had here our great exponents of liberty. Liberty is a process of doing things and enjoying things, not simply believing in some general principles. And there is no so secure home for liberty as the land in which the children are taught to love home. Obedience, docility, affection for father and mother, brother and sister, and kindred, these are the very beginning of all patriotism, the beginning of all true and sound life. If New England men and women rise to their opportunities, as well as to the demands that are upon them, then the future of New England agriculture will take care of itself, with all of the other industries; and I believe there is no calling in which a man can have so secure and comfortable a home, can be so free from the chances and changes of coming and going disaster, can give his children so good a start in life, with a sound education and a sound constitution, and can so well perform those duties to his country which every man owes, as citizen, and neighbor, and patriot,—there is no occupation in which a man can do all these in so full measure and with so great satisfaction to himself and so great benefit to his fellow men, as in the occupation of farming,—tilling the soil.



OLD FERRY ACROSS ANDROSCOGGIN RIVER NEAR BETHEL.

INSTITUTE PAPERS.

LECTURE DELIVERED AT STATE FAIR GROUNDS, LEWISTON, SEPTEMBER 2, 1896,

By Dr. A. W. HARRIS, President of the Maine State College.

Ladies and Gentlemen: The institution which I represent, sometimes called the agricultural college, has been criticised because it has not turned out more farmers. What I say this evening will be in justification of the course which the State College has followed. I need not come before this audience of farmers with any detailed statement of the agricultural work we are doing, for you are familiar with it, but it may not be amiss to show that some of the work which does not result in sending men back to the farm, may yet be of great value to agriculture.

It is something that the State College has opened before every humble farm-house throughout the State an avenue through which the farmer's boy may reach a competence, and attain to usefulness. We sometimes lament the fact that so many of our farmers leave the State. I trust that the time will come when our boys will stay at home, but the welfare of our boys is to be considered before our own desires. A few years ago we hoped a Maine boy might be called upon to leave the State to serve as president of the United States. If our boys have left the old hills of Maine, they have found in the Southern and Middle states, in the West, and even in Massachusetts, opportunities to do well the world's work. The first mission of the State of Maine, its agriculture, and its State College, is not the upbuilding of the material interests of the territory we call Maine, though this is important, but rather to start in the right way our boys and girls, who find in this old State their first chance for a livelihood and wealth and honor. If they realize their ambitions, let us rejoice, whether they do it here or beyond the Rocky Mountains. The geographical boundaries of Maine are not the limits of its brains and effort; wherever you find in the West, men of energy and push, you are sure to find a part of the State of Maine. It is the pride of the State that she has contributed her northern hardihood and vigor to the improvement of every section of the country.

On the train to-day I heard a man say: "The purchasing power of a dollar depends not only upon the dollar, but also upon the man who has it." The statement is true. The purchasing power of a dollar does depend, in practical life, very largely upon the man who spends it. Agriculture, in the same way depends upon not only the fertility of the soil, but also upon the fertility of the farmer's head. The farmer counts for as much as the farm.

I suppose the first farmers were land robbers, who collected from the woods and fields what they could, with little effort. The real agriculture or field culture began when this method failed, and I am willing to risk the statement that soon after men began to be agriculturists they began to be investigators. Some of the first great improvements, we never think of as having been such. For instance, I am certain it never occurred to me until suggested that our commonest Maine product, hay, was ever the result of investigation. Yet in the time of Queen Elizabeth the average steer weighed only about 400 pounds because there was no winter feed for the creature, except what he could pick up in the somewhat less rigorous climate of England. The grasses from which the first hay was made, were found in Virginia. Since hay became a common commodity, we have been breeding bigger and heavier cattle.

In this country, investigations in agriculture began very early. In 1844 the government began to make some very simple investigations, which hardly ought to be called investigations at all. It began by distributing seeds and plants. The seed distribution is now a cheap way in which politicians flatter their farmer constituents; and the worst of it is that the farmers are quite willing to be flattered by receiving little packages of seeds, worth one and a half, or two cents apiece. But seed and plant distribution, when begun, was a sensible thing, and I want to name some of the noteworthy results that followed the early distribution. One of the most noteworthy successes was the introduction of the Eucalyptus tree. When I visited California I noticed a row of very slim, high trees, from which my host told me, he had made more money than from his oranges. When they were three years old, he cut the trees off, ten feet from the ground, and sold the wood for firewood, and three years later he had three shoots each as big as the original tree. This tree gave Southern California nearly all its firewood. It is also valuable as a preventive of malaria.

Another introduction was the Fultz wheat. A few bags were sent out to a postmaster in California, who having no use for it, asked a farmer to carry the bags away. He planted it, and the result was the famous Fultz wheat which has been a source of more wealth to the state of California than all the gold ever taken from it.

Another introduction has not met with complete success, but is promising. I refer to the introduction of the Russian apples into the interior and northern sections of the country.

In the greenhouses of the United States Department of Agriculture is an old orange tree that has a history. Years ago a missionary wrote home of a wonderful orange which had no seeds and was unusually sweet. The gentleman to whom she wrote had a keen sense of the possibilities of improvements, and asked her to send cuttings. These were sent three times. One of the third cuttings grew, and became the first naval orange tree in the United States of America. One man told me that the introduction of that orange had meant a profit of $30,000 to him alone. It is the orange which is most generally raised in Florida and California.

A more important line of work is illustrated by investigations in regard to farm machinery. I need not speak of the improvements in the kinds of machinery in use upon Maine farms. They are familiar. At the Columbia Exposition I saw a plow said to have been used by Daniel Webster. If he did use it, he was indeed a man of wonderful strength and skill. It is a marvelous comparison with the plows that we use to-day.

A few illustrations of another sort will serve my purpose somewhat better. A few years ago during a visit to Louisiana, I was taken to see several sugar mills. A Louisiana sugar farmer runs no risk of hearing the uncomplimentary epithets sometimes applied to Northern farmers. He is never called a hay-seed, for a sugar farmer must have a very large capital, in some cases running as high as $1,000,000. His machinery, of the most elaborate and delicate kind, has been developed from the most simple and primitive forms.

Some of you remember the times when there used to be settlings in the bottom of the molasses jug. When I was a child, the children used to compete for a chance to dig out the sugar settlings. Your children know nothing of such settlings, and the reason is found in the great improvements that have been made in sugar manufacture. The great stone rollers first used, were replaced by rollers of steel, through which the cane was passed to squeeze the juice out. But it was not possible to roll the cane so as to get out all the juice, and therefore part of the sugar was lost. The machinery was improved until there was a very elaborate set of rollers, which left the cane very dry as it seemed, but it still contained some sugar. At last, it occurred to some one to push the juice out of the cane instead of squeezing it out. The sugar cane was cut up into little chips, packed into tight vessels, and then hot water was driven through the vessel, under great pressure, which pushed the juice out of the chips. These vessels were arranged in a battery or series and the water was driven through all in succession, so that each vessel had several charges of water. The improvement gave an enormous increase in the yield of sugar. The man who made that discovery did for agriculture more than any institution in the world could have done by sending out many farmers, educated with all the book learning that all the colleges can give.

The Babcock machine for testing milk is another important invention. The last secretary of agriculture came into office with an idea that the experiment stations were not worth their cost. I was then director of the office of experiment stations, and attempted to pursuade him that he was mistaken. He asked me to tell him of one discovery that was worth anything. I replied that I considered the Babcock machine not only worth something, but worth the capitalized cost of all the experiment stations in the United States, and statistics seem to bear me out, not only, or chiefly, because it enables you to tell how much fat you have in the milk, but because of the effect its systematic use by the breeders will have upon the cows our grandchildren will keep.

Another improvement consists of the proper understanding, and consequent logical use, of old methods. It used to be thought by the farmer that the only reason he hoed his corn was to keep the weeds down. Science teaches that there is another reason, which is often a more important one. At a little distance below the surface, the soil is full of water which is drawn up to the plants by a force which we know as capillary attraction. If you put a small tube into water, you will notice the water climb up in it. Put a wick into water and something makes the water disappear. The water climbs up notwithstanding the law of gravity. The soil is full of little irregular tubes, which act like a wick, and the water is continually climbing up through them to the surface, where the sun shines on it, turns it into vapor, and carries it away. When water is scarce the farmer wants the water to climb up to the roots, and stop there, so that the plants may get all of it, and the sun none of it; and then he needs to hoe the ground so as to break up the little tubes, before they reach the surface. Thus science teaches us the philosophy of a practice as old as agriculture, and the farmer understands why it is that keeping the hoe and plow and harrow going in a time of dryness, is likely to help the crop even though the weeds do not need subduing.

Some really magnificent work in relation to insects has been done. We have, most of us, believed that the Revolutionary War was over, but it is not, for the Hessian fly brought to America by the Hessians remains, and though we have conquered the Hessians we have not yet vanquished the fly. If you want to understand what it is to completely beat out an insect, read the history of the Gipsy Moth Commission in Massachusetts. Let us take warning of the past, and introduce into our midst no insect with which we are not acquainted. We ought to require the best certificate of character before we allow any insect to come among us.

When one speaks of insect triumphs he must soon quote the name of Prof. Riley. A familiar instance of his work sounds almost like romance. In California a few years ago there appeared upon the orange a new scale insect, looking very much like a linseed, split in two, and stuck tightly on the tree. Little attention was paid to it at first, but it spread rapidly, and the alarm went through the State that the golden crop—for the orange is the golden crop of California—was threatened, and men trembled as in the face of a great disaster. An appeal was sent to Washington for help, an investigation was made, and the scale traced to Australia. An agent was sent to Australia who found a lady bird which preyed upon the scale, and prevented its increase in dangerous numbers. A few of the bugs were brought back to California in boxes, put in the ship's refrigerator, and visited every few hours to be sure they were comfortable and in good health. Arrived in California, they were bred and set free upon the infested trees. The result was almost miraculous. The lady birds soon reduced the numbers of the scales and saved the great industry of a great state.

Another triumph associated with the name of Prof. Riley is the treatment of the phyloxera, that attacked the grape vine in France. Information was sent to this country, and the professor was interested. We had the same trouble, but it was not a serious one. Our grape vines resisted, either because they had grown accustomed to the trouble, or because of an acquired strength, in accordance with the survival of the fittest. American grape vines were sent to France, and resisted the attacks of the phyloxera. For his service to France Prof. Riley was held in high esteem, and made a member of the Legion of Honor. An attractive, though not very important, discovery in regard to the chinch bug, was made by President Snow of the State University of Kansas. A farmer sent him some dead bugs, from a field in which a great many dead ones had been found. It turned out that they had died of a contagious disease, which President Snow made a systematic attempt to spread, and with considerable success. He kept a few sick or dead bugs in his laboratory and made a bacterial culture of the disease, and was able to exchange diseased bugs for healthy ones. The messengers of disease went throughout his state and other states, as the servants of the farmers.

Of course, no one can talk on such a subject as mine without mentioning bacteria. This is the age of bacteria; they are everywhere, in the papers, and in the air. Every man you meet can talk learnedly of them. There are two classes of bacteria, the good and the bad, and we must treat them as two classes, if we treat them intelligently and expect to get the best results. Some of the things the good bacteria are supposed to do are quite as interesting as the horrible things the bad bacteria are supposed to do.

I was interested in a proposition made by the Georgia Experiment Station some years ago. The tobacco that comes from Havana brings an unusually high price, and its excellence is said to be due to an unusually good kind of tobacco bacteria. One of the Georgia experimenters found or thought he found a way to isolate,—that is obtain by themselves—the Havana bacteria, cultivate them, and transplant them to Georgia tobacco, which was so changed by the bacteria that the most learned northern smokers could not tell the difference between the Georgia treated tobacco, and the real Havana tobacco. I do not know how the experiments are working, but they are entirely possible, certainly very practical and very suggestive. The similar use of bacteria in butter making is so familiar and common that I need only mention it.

These things are of a kind well known to you, and I think they teach their own lesson. Only a few words are needed to make clear their relation to the institution which I represent. I have been invited to speak to you chiefly because I am the president of the State College. There was a time when many believed it unwise to provide free high schools. That time is past, but there are still many who believe that public high schools carry state education far enough, and collegiate education should be for those who are willing and able to pay for it. That day is passing, and my presence is testimony that the State of Maine believes that the day has gone by, and ought to go by. The State College is an expression of the belief of the State, fortified by appropriations of large sums of money, extending over a quarter of a century, that it is the right and the duty of the State to see that every boy and girl within its borders shall receive the best education it can afford to give, from the primary school to the college.

The college represents also the belief in the possibility and utility of a college education, not only for those who enter the learned professions but for the great mass of the people, who in other ways must earn their bread; the belief, that higher education should include not only instruction in the classics, literature, etc., but in the sciences, and in the arts that touch most closely the practical avocations of life as well. The classical and literary studies should be maintained. There is little danger that the people will get too much of the culture and inspiration, which the literary and aesthetic studies give. But there are many who can not give the time needed for the old college course or have not the taste for it. For these we must provide scientific and technical instruction. The two lines of work should have equal honor and so far as possible should go on together, in order to cultivate the respect and allow the reciprocal influence, which knowledge of each other will produce between the two lines of work.

To be definite in the matter which most interests us to-night, I believe that the State College ought to furnish those interested in agriculture instruction to prepare them for their work, whether it be on the farm, on the press, or in the experiment station. The colleges that teach the agricultural sciences have not turned out many farmers, but I think I have said at least enough to suggest that had the colleges never produced a single farmer, they have earned more than all they have cost, by gathering and preparing for your use, knowledge that shall make many farmers, who have never seen the college walls, better able to do the work that the farms require, knowledge that the farmers need more and more sorely every year. The time when any man could get a living out of a farm, is no more. The man who makes a fortune at farming in these days must have brains, and they must be well cultivated. It is in their cultivation that the State College, and every college finds its work.

PRACTICAL ROAD IMPROVEMENT FOR THE STATE OF MAINE.

Delivered before the Maine Legislature, by Gen. Roy Stone, Washington, D. C.

Mr. President, Ladies and Gentlemen:

It is due to the very courteous invitation extended me by the Board of Agriculture of the State of Maine that I have the pleasure of addressing you to-night. On my own part I represent, as far as I am able, the Department of Agriculture of the United States. It is proper, then, that what I have to say to-night should be addressed especially to farmers, and if I speak to the audience generally I mean it especially for the farmers in the audience, and not necessarily for the others. And yet all ought to be interested in what interests the farmers of the State of Maine.

The question naturally arises in your minds, What has the general Government to do with the question of the roads in the State of Maine? Away back in the early days of the Republic the building of roads was a very serious concern to the general Government. For fifteen or twenty years before the general Government began the improvement of rivers and harbors, it had a great deal to do with the laying out and construction of roads in the United States. At that time the construction of rivers and harbors was thought to be a function of the states, and the construction of roads a function of the Government, but now they have changed places. The Government then laid out twelve or fifteen national roads throughout the United States, supposed to be a complete system of highways, and on one road five or six millions of dollars were spent. Other roads were merely cut through the woods or blazed out; others were improved to a greater or less extent. In the course of time there came to be difficulties in the way of national road construction, some constitutional difficulties and some financial difficulties. The great crisis of 1836 put an end to all enterprises in the United States, and it put an end to the road building by the United States. The constitutional questions that were brought up at about that time have never practically been settled, and yet the Government has in a small way gone on building roads ever since, but in so very small a way that it has not been necessary to raise the constitutional question. The feeling has been that the Government has nothing to do with the question of roads in the states, and no one took the ground that it had anything to do in that direction, to any practical extent, but about four years ago this last autumn a number of us who have been working for good roads for a good many years in the United States individually, thought that we would get together and form some kind of an organization. We formed an organization during the opening of the Columbian Centennial proceedings at Chicago, at the time of the dedication of the buildings for the World's Fair, which organization we called the National League for Good Roads. It happened to fall in with the general sentiment of the country at that time, and we were able to carry it on for a year by private subscriptions, and we raised and spent about $10,000 in the campaign for good roads. In January four years ago we held a convention at Washington, and it was discovered that the Government took a very deep interest in what we were doing. Our convention was attended by members of Congress, the Secretary of Agriculture, and a representative of the War Department, and it created so much interest in Washington that we ourselves were astonished. We had about twenty-five states represented by volunteer delegates who paid their own expenses, some even from the State of Maine,—our good friend Prof. Hamlin being present. The members of Congress who met with us said that we would not succeed in carrying this work on indefinitely by private subscriptions, and we had better get an appropriation. We were perfectly contented to have an appropriation, and from that time on the Government has appropriated about ten thousand dollars a year, through the Committee on Agriculture, and put it at the disposal of the Secretary of Agriculture. The Secretary of Agriculture, finding that this had been brought about by the work of the National League, decided to put the administration of this appropriation into the hands, as far as possible, of that league, and I was accordingly appointed to take charge of it, and that made me, very much to my astonishment, a Government official in the interests of good roads.

We have carried on, from that time to this, a steady investigation of what was going on in the United States in the matter of road building. We have not had very much money, but we have had a great deal of voluntary assistance. A great many men, all over the United States, have helped us to gather information, and we find that there is a great deal going on in the United States, a great deal that very few people know anything about; a great deal going on in some sections that is not known outside the counties. And actually the question of road building is being solved in the United States to-day by the voluntary action of the people themselves in different sections of the country.

I am particularly delighted to see the State Boards of Agriculture, and the farmers' organizations generally, taking up this subject. I came directly here from a meeting of the State Congress of Farmers in New York. They devoted nearly the whole day yesterday to the question of good roads. It is a congress composed of representatives of all the various agricultural organizations, official and unofficial, in the state of New York; a very wide awake body of men, and they are thoroughly determined to have good roads in that state. They have determined to take the lead of the movement themselves, and not merely to take the lead, but to ask the help, and accept the help, of all the organizations that are willing to help them.

A little while ago we had a conference at Syracuse, New York, in which the representatives of the State Grange—the farmers' organization—the representatives of the wheelmen's organization of the United States, and the representatives of our office at Washington, met together and studied upon the question of what could be done in the state of New York for roads. The meeting was thoroughly harmonious, and I believe that the farmers' organizations, and the wheelmen's organizations, and the trade organizations, of the state of New York will work in perfect harmony in bringing about the improvement of highways in that state. When that can be done everywhere there will be no sort of difficulty in improving the highways of the United States just as rapidly as the work can be done. Of course I have not had very much knowledge of what has been going on in the State of Maine. I know that there has not been very much done in the actual building of good roads, but I do not know how far the varied interests in favor of good roads are acting together, or can be consolidated, in this State. I say to you now, that one of the very first things you can do, the most important thing, is to see that all the interests working for good roads harmonize, and work together from this time on. You may have to concede something in reference to your especial ideas as to road bills, but the concession ought to be made in the beginning. There ought to be no competition and no opposition when you come into your legislative bodies.

The actual work for good roads in the United States has been done to a great extent by farmers. I do not mean the campaign of education and the agitation for good roads, but the actual preparation of measures and the carrying out of measures for good roads have almost altogether originated with the farmers in the United States. The wheelmen have done capital work in stirring up public sentiment, but the practical working measures have been almost entirely organized by the farmers. The farmers in New Jersey, for instance, were the authors of the state aid law in that state, and that is one of the best solutions of the good roads problem that has been made anywhere. I will give you some details of it after a little.

The farmers have great reason to take up this question, and they have a reason that many of them have never thought of. It is due to them, in absolute justice, that the whole business of road construction should be remodeled, and a portion of the burden that they have unjustly borne ever since the organization of our Government, taken from their shoulders. The farmers of the country have been charged with the whole expense of building and maintaining the roads for all the people of the country. The farmers in the State of Maine own one-fifth of the property in the State, and that one-fifth of the property has paid the entire expense of building and maintaining the roads of the

State, which are just as necessary to the people who live in towns, and the people of other occupations than farming, as they are to the farmer. It is time that justice should be done in this matter. The farmers in the state of New York own only one fourteenth of the property in that state. Every farmer in that state has been making roads for thirteen other men to travel on, and he is getting tired of it. He means now that something shall be done to stop it. And as far as I am able to ascertain, the people of the cities and large towns, the manufacturing people and the commercial people, are perfectly willing to bear their proper share of the expense of improving the roads of the country. There are a thousand considerations that make it to their interest to do so. There is no need to go into these, since they have discovered them themselves. Any of them will tell you at once why he wants good roads in the country, and why he is willing to do something towards obtaining them. The only drawback to-day is that the farmers themselves have been afraid to let any change be made in the road laws of the country. They have been afraid that the people of the cities have some design to impose upon them heavier burdens instead of taking off some which they already carry.

You have very special inducements in the State of Maine to undertake the improvement of your highways. I do not need to tell you what a beautiful State you have, nor anything about the magnificence of your mountains, your valleys, your lakes, and your sea shores. The tide of summer visitors coming to this State tells its own story.

If the State of Maine belonged to a wide awake real estate syndicate, the very first thing they would do would be to spend about fifteen or twenty millions of dollars in improving the highways of the State. The State has every other attraction, in climate, scenery, etc. It can attract people here, but it cannot give them the one thing they care most about when they get here, and that is the means of getting about and seeing the country to advantage. If there were nothing in the way, it would be a remarkably good speculation for the State of Maine to borrow some money and go into road building. But there happens to be something that appears to stand very much in the way of it, and you must adopt some means of finding out what you *can* do. That is the very first thing to be done. You cannot find out in the short duration of a session of the legislature exactly what you can do. You must put somebody to work upon this question, just as the state of Massachusetts, the state of Rhode Island, the state of Vermont, and the state of Michigan have done, and the state of New York proposes to do. The state of California also has begun with a commission of inquiry, to find out what could be done. Every state that has done anything in the way of road improvement has begun in a similar manner. Some of these commissioners of inquiry have been gentlemen who have volunteered their services and the state has paid something towards their expenses; others have been gentlemen who devoted their whole time and received a small salary. The commission of the state of California consists of three men, and they have actually travelled over nearly all the roads in that state. These men give their whole time to this work, and that state has gone into the matter of road building in a thoroughly business-like way.

You have, perhaps, a greater variety of industries in the State of Maine than in any other state in the Union, and on that account you have an especial inducement to go in for good roads. You have an advantage over almost every other state in your road materials. There is a wider distribution of road materials in the State of Maine than in any other state in the Union.

Taking it for granted that you want good roads in the State, and that you are going to try to get them, I will take up two or three practical questions in reference to what might be done in this State while you are studying the way to do more.

The question of the local administration of the road funds, the actual expenditure of the money and labor that are put upon the roads of the State, is something that you can take up and act upon at once. You all know from your own experiences how valueless a great portion of the labor and money that are put upon the roads in this State is. You all have some idea of how an improvement might be made. I understand that there are one or two bills to be introduced early in this session, for the improvement of the local administration of your road affairs. If the farmers of the State will take up this matter, and see that the money that is spent on roads, and the labor that is supposed to be put upon them, is as well expended and as well applied as the money and labor they use upon their own farms, you can start road improvement in your State this year. You could start with improved methods of application of the present funds and labor which would show results before the season was over, and your summer visitors would go home and say, "They have begun the improvement of roads in the State of Maine."

Just how you shall do this I cannot say, because I do not know precisely what your system is here, but I will tell you what they propose to do in the State of Pennsylvania, where they have given a great deal of attention to this particular subject. Prof. Hamilton, deputy secretary of the Department of Agriculture, and professor in the State College, has given a great deal of practical attention to this question of road administration. He had himself chosen road supervisor for that purpose, and served in that capacity for two or three years. And he has been put into the Department of Agriculture in order that a reform might be made through the knowledge that he has acquired in the administration of the road funds in the state. He begins by having road days in all of the farmers' institutes. Three hundred of these meetings will be held in the state of Pennsylvania this year. Three hundred days of the farmers' institutes will be devoted to good roads. I will give you Prof. Hamilton's scheme in a few words, and I think it is a very good one. I will send to the secretary of your Board of Agriculture, as soon as I get them, copies of a bill which is being introduced in the Pennsylvania legislature, and any one who is interested can obtain them. They are going very slowly and moderately, but surely, in Pennsylvania. They now spend four million dollars in money and labor on their roads, and the roads are not being improved, and they are tired of it. Prof. Hamilton believes that if that money was well expended, two-thirds of it could be put into permanent road improvement every year, and the other one-third would keep the roads in better condition than they are now, and at the end of nine or ten years, they would have good roads all over the state. He says that in many districts of the state the supervisors are elected but for a single year. Any policy in road construction that might be adopted by such a board could not be fairly tested in so short a period, and consequently those in charge hesitate to begin any work of permanent improvement for fear they will not be continued in control for a sufficient time to demonstrate its value. A degree of permanency could be secured if the supervisors were elected for three years, one going out each year, and leaving the two old officers as a majority in control, giving time to the newly elected official to become acquainted with the system and understand its purpose before any radical change could be effected. He says at least one-half of the road tax ought to be paid in cash. I understand that it is optional in this State for the towns to pay the tax in cash or not, and that about one-fourth of them have adopted the cash system and are well satisfied with it. I find that this system gives satisfaction in every state that has adopted it, and I have no doubt that you have progressed here in that direction to the extent that you will at least be able to have one-half of that tax paid in cash in all the towns in the State.

Prof. Hamilton also has an idea that these road officers should not be salaried officials, but the best citizens of the town, who are willing to serve the public, and that they should not themselves be expected to go to work on the road, or even to call out a force to go on to the road, or to expend the money. But that they should hire the best men they can find, and carry on the road work just as you would carry on any other work that belonged to the community. Then the man who actually calls out the men to work on the road, and who spends the money that is alloted to him, has no fear of the good or ill opinion of the persons he employs; he is not looking for election next year, —for another soft job. And the result will be that this man who is paid can call out the labor and work it to the same advantage that the farmer would work his own hired man. There are a number of other provisions in that bill, in the same direction. I will send the bill to you, and I think it will be worth while for your committees to take it into consideration when they are considering any bills for the administration of roads.

Among the matters that we have investigated with the utmost care is the actual cost of bad roads, or the advantage of good roads. That subject has been examined from a good many points of view, by a good many different people, and not more astonishing is the amount of this tremendous tax than the agreement in reaching that amount from so many different sources. The secretary of the National Farmers' Congress, who is a very bright statistician, worked it out from his point of view, taking the railroad returns of freight, and the amount of it that was hauled over the public roads. He makes the needless cost of moving the farm products of the United States,—the cost beyond what it should be,—to be $600,000,000 a year. Prof. Latta of Purdue University investigated it from the point of view of the farmers of Indiana. In that State they have some good roads; not the highest class of roads, but about 10,000 miles of very good gravel roads. Prof. Latta worked it out, and found from the reports of the farmers themselves, those who lived on the good roads and those who lived on the bad, and those who had lived on bad roads before they were made good, taking their average opinion, that the difference between the good and bad roads was seventy-eight cents an acre annually, on their farms. This taken all over the farm area of the United States would make $500,000,000. The farm area is a little over 1,000,000 square miles, or about 650,000,000 acres. The author of the Highway Manual of the state of New York took it up from the experience of a single farmer in the state of New York, and he made it $1.25 an acre. I took it up from another point of view, or, at least, I took a broader view of it. I sent out letters to the 10,000 farmers in the United States who had been selected as the best representative men to gather statistics for the Department of Agriculture. I got a great number of replies and averaged them. We took the census returns as to the amount of farm products, and these men gave us the average cost of hauling their products to market, and the products of their neighbors, as far as they could judge, and from these we got the total amount, which was $620,000,000 to $630,000,000—excess over the actual, proper cost of hauling. I took the proper cost to be the present cost to the farmers in the good roads district of New Jersey, where there are actually as good roads as are found in any part of Europe. The cost of hauling over the ordinary roads of the country is just about three times as much as the cost of hauling over good stone roads, or, in other words, these costs are in the proportion of three to one. Where a load is three tons on the good roads it is one ton on the average farm roads. The average cost of hauling one ton a mile, throughout the United States, is twenty-five cents. In the New England states it is thirty-two cents, they being more hilly and having generally worse roads. The cost in New Jersey runs from seven to ten cents.

The actual extra cost of moving products is not the only loss by bad roads, by any means. Farmers lose by not being able to get to market when the market is good, by the waste of products that cannot be marketed at all on account of bad roads, by not being encouraged to cultivate things that require a speedy market, and in a great many other ways. The actual money loss to the farmers of the United States by the bad roads of the country is not less than one-fourth of the total home value of all their products. The total home value of the annual products of the United States farms is about $2,500,000,000, and the loss by bad roads is about $600,000,000; so that the farmers lose, or they would lose if they could stand all that loss themselves, one-fourth the value of all their products by the extra cost of getting them to market. They do not pretend to be able to stand all that loss themselves. They stagger under it as well as they can, and bear all they can of it, and the rest they saddle upon the consumer and the dealer. That is one reason why the people of the cities and towns are beginning to understand that they are interested in good roads. One reason why the boards of trade and the commercial bodies in the United States are getting interested in good roads is the fact that the whole business of the country is suffering for the want of good roads. The Chamber of Commerce of the state of New York expresses it in this way: "The movement for good roads deeply concerns every commercial and financial interest in the land. We are handicapped in all the markets of the world by the enormous waste of labor in the primary transportation of our products and manufactures, while our home markets are restricted by difficulties in distribution which not infrequently clog all the channels for transportation, trade, and finance."

The question of State aid is one that suggests itself to you, unquestionably, and is probably the most important one to be considered. It is not a question of immediate action on your part, as I fancy you are not quite at the point yet where the State would be willing to actually aid in road construction. This is the only method, probably, in which the State can help in road construction, and if you have a commission to look into this question, and they report in favor of some State aid, you will probably find some way at the next session of the legislature to provide for it on the part of the State. The best method of getting at state aid that has been developed as yet, best for the State of Maine, I mean, is the New Jersey plan. I do not think that you in the State of Maine could follow the Massachusetts plan of actually building State roads. In fact, you have not the privilege of borrowing money to do it with, as they have in Massachusetts. I do not think you would care to follow the Connecticut plan, which is somewhat similar. But the New Jersey plan, with some modifications, is just what you would need. It is better to let your road improvement begin in a small neighborhood than to require action by a county board, or even a township board. In New Jersey it begins with a petition by the property owners along any particular piece of road. If they come together and say that they are willing to be assessed ten per cent. for the purpose of improving the road, the county goes on and improves it, and the state pays one-third the cost. You do not have to start with a whole county, and there is no opportunity for local jealousies, no question as to whether it should be this road, or that road, or the other road, or which ought to be the principal township or county road. The people who are willing to help themselves are the first to be helped, and that is the best method I have seen anywhere of starting road improvement. I would recommend that the local contribution should be increased to one-third, and that it should extend over all the area that is drained by that particular road,—all that is directly benefited by it. The benefits are extended to people who come in from the side roads; and you will find that the actual benefited district of a road can be marked out just as accurately as the drainage area of a stream. You can see where the travel is coming from, and you can tell in one year just how many people ought to contribute to the cost of it. I believe that you would be able, in the State of Maine, to find plenty of wide awake neighborhoods that would avail themselves at once of a State aid law of this kind. You do not have to organize any boards, but simply call a meeting of neighbors to sign a petition for the improvement of the road, and agree to pay in proportion to the benefits received, those along the road paying more than those back a mile or two. You will get started then very quickly. The county has to go ahead and build the road; or in your case very likely it would be the township instead of the county. I do not know that the county has an effective working organization in this State. The counties are not so strong in the New England States as in the Middle, and most of the Western States. It might be that in your case the neighborhood, the town, and the State, would make up the three.

I only give you that as an outline, because it is not practical yet, as I understand the condition of things here, to go into that line of legislation. I suggest it as a method by which State aid may come in without exciting local jealousies and without waiting for the education of whole communities, like a county or township; so that a wide awake, smart, energetic neighborhood can get the benefit of the State aid, and the county or township aid, and not do any injustice to its neighbors. It is perfectly proper that those who are willing to help themselves should be helped, and those who are first ready should be first helped, those that come in afterwards taking their chance of getting in on the next appropriation. The effect of this distribution in neighborhood groups in New Jersey is to make public opinion prompt and active for more appropriations and for more road work the next year. The appropriations have been continually increased in that state, as in Massachusetts, which has followed the practice of distributing the work all over the state in order to have object lesson roads, and create public sentiment. At first some of the farmers in New Jersey were opposed to the method, but now they jump over each other to get in their applications, for they see the benefits of it.

Good roads are the highways to wealth. If I could take you with me north, south, east, or west, to where the beginnings of road improvement have been made, I could show you small farming communities growing rich in these hard times, contented and happy, and troubling themselves not at all with the great problems of finance which agitate their brethren. They have no time to waste in talk. If their fields are too wet to work they go on the road. Their marketing is done in bad weather, and in rainy spells they bring from a distance cheap fertilizers to enrich their farms, such as marl, city refuse, etc. Philadelphia refuse is carted twenty miles out, on the stone roads. In these fortunate communities every day brings its earnings to man and beast, for there is always paying work on a good road, and if a man has no hauling of his own to do he can get work from others, and good wages. Extend these conditions and imagine, if you can, the prosperity that would burst upon the country if every farmer and every farm team could earn a fair day's wage for every day in the year, rain or shine; if every farm could be cultivated and improved to its utmost extent.

It is not an uncommon thing in France to see a farmer forty or fifty miles from home in wet weather with a heavy load. If he sees a prospect of a three days rain, he puts his tarpaulin over his load, a cover over his horses, and a waterproof coat on, and starts off to market. He may go fifty miles before he finds a market that suits him, or he may know in advance just where he is going. You do not often see anybody driving fifty miles through a rain storm, in the United States, to find a market for a load of hay, but it is not at all uncommon to see farmers' wagons forty or fifty miles from home there. They choose the wet weather for that purpose. Their roads are just as good then as at any time.

When I first begun this inquiry I heard incidentally that there were some especially good stone roads being built in Canandaigua, New York. The people of New York outside of that village did not know anything about it, and I could hardly believe the stories that I heard, so I went there myself, and to make sure that I should make a thorough test I went in the midst of a January thaw. I got a pair of horses and a light buggy, to test the other roads around the country, and I found that with a great deal of difficulty I could drive over them. I went on to these farmers' stone roads, and I found that they were hauling two tons of hay, with two ordinary horses, on a common narrow tired wagon. I said to them, "How did you get started in this business of building roads?" They said "We started it ourselves. We thought we could do something, as our fields are full of stone, with stone fences along the road; so we scraped together enough money to buy a rock crusher, and we hired an engine to run it, and made arrangements with the farmers to bring in the stones and haul back the crushed stone." They have built in that township, every year for the past four years, from three to five miles of this character of road, and they have done it by direct, actual taxation on their own property. They have even petitioned the legislature for the privilege of increasing their taxation beyond what the law allowed; and the result is that all the farmers in that town are anxiously waiting for the roads to be extended into their particular neighborhoods. I said to them, "Doesn't this pile up on your taxes pretty well?" "Why," the farmer said, "in this one week, by the advantage of having these good roads and getting to market with my hay when it sells at a good price, my teams have earned $5.00 every day, while my neighbors' teams on the other roads are eating their heads off. We could not afford not to have these roads; we do not care anything about the taxation." There is an instance in which the people took the bull by the horns. But it is not necessary to do that. I only relate this instance to show how great are the advantages of good roads.

I have one thought that I want to throw out here for your consideration. I have been looking at the question of convict labor in this State. I do not know whether your convicts in the State prisons are satisfactorily employed, but if they are you are very much better off than the people in other states. In New York, in the Sing Sing prison we have one thousand able-bodied men marching around for exercise, because our labor organizations are not willing to have them compete with them. California was in the same situation. I went out there two years ago at the governor's request, and looked the situation over. I said, "Why don't you put your convicts at work quarrying stone and preparing material for the roads of the state?" They passed a law authorizing the employment of convicts in that way, appointed a state highway commission to take charge of it, and put their convicts at work quarrying stone. At the Folsom prison they have a vein of trap rock which runs through the grounds, a splendid water power, and a railroad running into the grounds;—every opportunity for turning out road material. They are actually furnishing to-day prepared road material to the counties of the state at twenty-five cents a ton, which is a little more than one-fourth, perhaps one-third, of the ordinary market price for road material. They were able to make an arrangement with the railroad companies for carrying that material at an equally low price; so that first-class road material is being delivered in the counties of California for less than you could buy it at almost any quarry. I do not know why something of that kind would not be practicable in this State. I am sure that it will be done in the state of New York, and I do not know why it should not be done here if you have any trouble with your convict labor. Of course if your convicts are properly employed as it is, there would be no advantage. In many of the Southern States the jail prisoners are employed in road making, some in quarries, and some out on the roads. I do not recommend a chain gang business of any sort, but I do decidedly recommend that the idle men in the jails and prisons should not be supported by the labor of honest men outside when they can be put to work in improving the roads for the country.

I observe by reading your State Constitution that you will not be in condition to borrow money for road improvement, on the part of the State; but I saw no prohibition so far as your towns are concerned, except a limitation to a certain percentage of the valuation. And I want to say to you that in all my experience in this road investigation I have never found a case where money was borrowed for road building, in which any regret has ever been expressed for doing it, or any increased taxation has resulted from it. On the contrary, taxation is almost always lowered by it. The town of Chester in New Jersey borrowed $40,000, and put it into roads in that neighborhood. They got about thirteen or fourteen miles of good roads for that $40,000. The roads cost about $3,000 a mile, as the material had to be transported 100 miles by railroad. They have steadily reduced the rate of taxation in that township ever since. The interest on the money has been very much over-balanced by the decreased cost of the ordinary road repairs.

The actual cost of road building has been a great bugbear in many states. In this State the cost need not be very great. The Canandaigua roads cost, with labor at $1.50 a day and team work at $3.00, which I presume is quite up to the rate here, less than one thousand dollars a mile; and there are very many places in the United States where good stone roads are being built for $1,000 a mile. Prof. Hamilton finds that in Pennsylvania he can build them for $500. His roads are very narrow and comparatively light, but perfectly satisfactory for the interior traffic of the state. They are composed of a stone bed, seven feet wide and six inches thick. The Canandaigua roads are eight feet wide and eight inches thick, except in wet places, where they are ten, twelve, or sixteen inches thick. I do not believe in building wide stone roads. There is no advantage in it and no necessity for it. It is better to have a good, smooth, clean earth track on one side, and on both sides if you have room, and simply have your central causeway of stone for the wet weather traffic. It is not worth while to throw away any of the advantages you now have. There is no road so delightful as a good, smooth, clay road, when it is dry; but you do need in most of the districts, if you have the money to do it and the courage to undertake it, a stone track for wet weather. The advantage of building a narrow road is that you spend one-half the money, and you save two-thirds or three-fourths in the repairs, because your stone road is only travelled in wet weather, and in wet weather it does not wear out. The stone road wears out in dry weather; but the dirt road, on the contrary, does not wear out in dry weather and does in wet weather. You can use your stone road in wet weather and your dirt road in dry weather, and you have the most economical arrangement. And with the road material which you have, in the fields, on the roadside, and in your quarries, you have the opportunity to make those roads all through the State of Maine, at a very moderate cost. When you once make up your minds to have these roads and go to work at it, you will be utterly astonished to find how easy it is to get them. It is no hopeless, impossible task; it need not be put off to the millennium. It is something that you can have, and have in your own lifetime, in the years that are remaining to the oldest of you here.

I think I have said enough, perhaps, to direct your attention to this matter, and I shall be very glad to answer any question that has occurred to any one in this connection. I shall be glad to send from Washington the publications of our office, which have become almost a library by this time, to anyone who takes interest enough in them to send for them.

I hope you will give this matter a good deal of thought, and carry it home and talk it over among your neighbors and friends, and that you will be able to improve the highways and byways of this State until at some time not far off it can be said of your beautiful commonwealth, "Her ways are ways of pleasantness, and all her paths are peace."

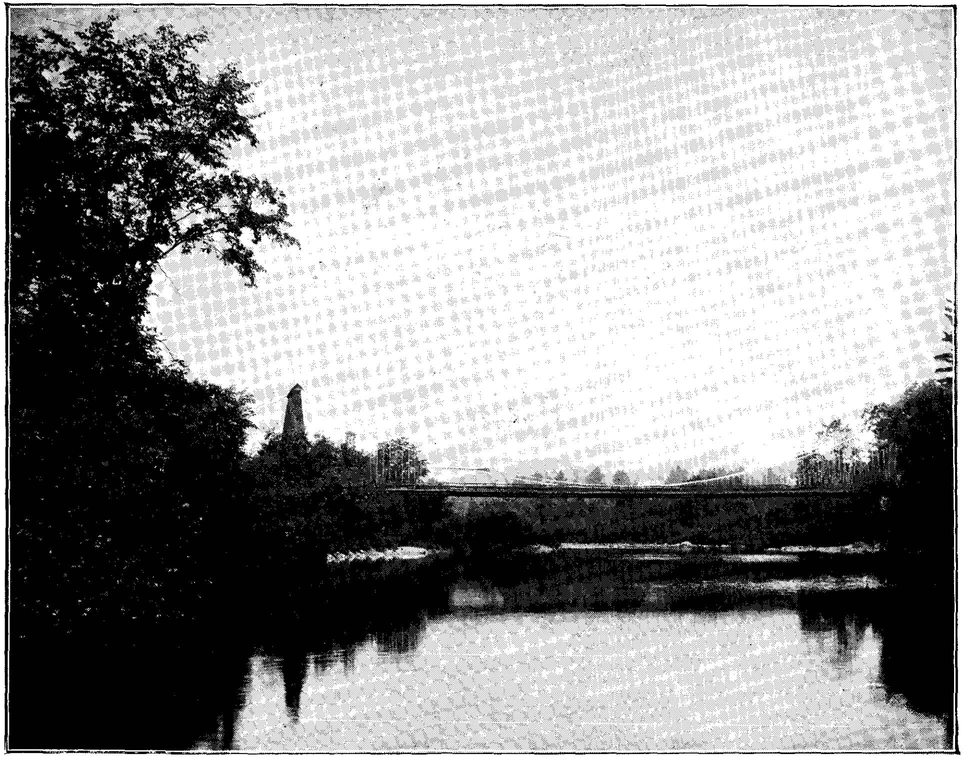
THE CHEMISTRY OF MEATS AND THE CHEMISTRY OF THEIR COOKING.

Lecture delivered at Fryeburg, by Prof. CHAS. D. WOODS of Orono.

Ladies and Gentlemen:—I never come before an audience but that I wish I were somewhere else, and I never select a subject but that I wish I might have selected any other subject under heaven, and I suspect that before I get half way through the audience sympathizes with me in both respects. I think it was Mark Twain who said that he was saddest when he sang, "and those that hear me are often sadder than I."

A short time ago I heard a new story of George Washington. He had been out on horseback, and when he returned he rode in the back way. The homestead at Mount Vernon consists of the main house and two wings, and out there between the wings he found Martha. She had some ashes out there, and he did not quite understand what she was doing. He said, "Martha, what are you doing?" "Making soap. Don't you see, here is this grease, and this barrel which has ashes in it, and I am pouring water on the ashes to make lye." "But—what—where did you get the ashes?" "You know that old stump; I dug that up and burned it, and I am using those ashes." "There is no lye in them, that was the cherry tree." So in what I am going to say to you I will try to steer clear of potash.

If there is any need of an excuse for the subject which I have chosen it may be found in this fact, that over fifty per cent. of all of the earnings of this country is expended for food. Over fifty per cent. of all the money which is earned in this whole broad land of ours is spent for that which we eat upon our tables. In 1878 were begun the first food investigations in an experiment station which were ever made in this country; the first analyses of American food materials for food of man,—



VIEW ON SANDY RIVER.

some cattle foods had been analyzed previously. From that time on to the present something like 1,000 or 1,500 have been made, for the most part in one laboratory in Connecticut. This work, taken up by the Storrs Experiment Station, seemed to be of so much value that two years ago the Government saw fit to take up these investigations, and an appropriation was made for carrying on the work. I have been intimately associated with that work from its inception, and I believe that there is no more important subject, nothing that comes nearer to us as a people, than the study of the foods that we eat. And while I can go into the subject only very slightly, and while there are only a very few things that I can speak of, I am going to confine myself to one topic. My subject is to be, The Chemistry of Meats and the Chemistry of their Cooking.

Many people regard chemistry as an occult science, a kind of magic, and view it with more or less superstition. It is expected to speak definitely of things too subtle to be handled, and yet its teachings are frequently doubted when it propounds general laws. We accept readily many of the absurdities that have been drawn from the science and frequently doubt its well-established facts. The above statements are illustrated in a case of a woman who had consented to our studying the dietary of her family. She expressed considerable doubt as to the reliability of the chemical study of such matters, but in the course of the conversation wanted us to make an analysis of a snake skin which was supposed to possess certain special medicinal properties, and to see wherein it differed from other snake skins! Some of us are inclined to accept all that investigation can give of the composition of feeding stuffs for animals, and the results of the uses of these feeds upon the animals themselves, while having but little respect for investigations into the chemical composition of the foods which man himself eats, and for digestion experiments upon man.

ANIMAL AND VEGETABLE FOODS.

It is natural to divide foods into two classes—animal food and vegetable food. Not only is this division simple and convenient, as pointing out the two great sources of man's food, but the classification is a true one, for the difference between animal and vegetable food is very striking in appearance, composition, and value in the economy of life. It is true that many of the chemical compounds which enter into the composition of these two classes of food are either alike or quite similar; but in general the vegetable foods contain large amounts of carbohydrates—such as sugar, starch, woody fiber, etc.—while the animal foods, and meat in particular, contain only small amounts of these carbohydrates. As regards the fats and nitrogenous matters or "protein," the case is reversed; for vegetable foods have comparatively little of these two classes of nutrients, while meats have relatively very large amounts. The value of meats as food, therefore, depends on the presence of two classes of nutrients, protein and fat. The protein is essential for the construction and maintenance of the body. Both protein and fat yield muscular power and maintain the temperature. It is possible to combine the fat of animal foods with the protein so as to meet the requirements of the body without waste, but the vegetable foods contain nutrients more especially adapted for the production of energy.

Another difference between animal and vegetable foods is in their digestibility. The compounds contained in the animal foods are, of course, very much like those of our bodies, and therefore need but little change before they are ready for use. The vegetable compounds, on the other hand, require much greater changes before they can be assimilated. They are less readily and less completely digested than the animal foods.

COMPOSITION OF MEATS.

As regards composition, the meats found in the markets consist of the lean or muscular tissue, connective tissue or gristle, fatty tissue, blood vessels, nerves, bone, etc. No general statement can be made with regard to the proportion in which these substances occur, as it is found to vary greatly with the kind of animal, with different "cuts" from the same animal, and with many other conditions.

Nearly all meats bought and sold in the markets contain some portions not suitable for eating, which may be properly designated as refuse. Some of these, as bone, contain some nutriment, and may be utilized to a greater or less extent in making soups, and perhaps in some other ways; but for the most part they are thrown away. In ordinary meats the chief refuse is bone. The percentage of bone varies so greatly that no precise statement can be made. In many species of fish, bone constitutes more than one-half the dressed weight. In some cuts of meat, on the other hand, notable the round of beef, slice of ham, and similar cuts in other animals, there may not be more than two or three per cent. of bone, and in still other cuts, as shoulder clod, there will be no bone at all.

Meats contain large and varying amounts of water. For the purposes of mastication, swallowing, etc., of course this is better than if the meat were dry; but the water contained in flesh has no greater value as food than other water. From this it follows that the greater the amount of water in a given weight of food the less is its relative nutritive value, for it will contain a less quantity of nutritive material. Fish and oysters have relatively more water than most other meats. In general, the greater the amount of fat in a given cut the less is the amount of water. For instance, a lean cut of beef may have seventy-five per cent. of water, while a fat cut from the same animal may not contain more than fifty per cent.

All meats contain some fat, partly stored in quantities so large as to be readily seen, and partly distributed in such small particles that it is only by chemical means that it can be obtained in quantities sufficient to be appreciated. In the flesh of some animals, as in cod and other white-meated fish, and in chicken (young fowl,) rabbit, and veal, there is little or no visible fat. In a very fat ox, on the other hand, one-fourth of the weight of the meat may be visible fat, and in the case of fat hogs, more than half the weight may be fat. No flesh is so lean as not to contain at least minute portions of fat. Very lean flesh, as codfish, may not have more than 0.3 per cent. of fat, while fat pork may contain more than ninety per cent. Fat is a valuable constituent of food. It is used in the body to form fatty tissue and is consumed as fuel, thus serving to maintain the animal temperature and to yield energy in the form of muscular and other power. Its fuel value is two and one-fourth times that of protein or the carbohydrates. The fat of animal foods might be so supplied that, together with animal protein, all the needs of the body could be met. The fuel constituents of vegetable foods are, however, better adapted to furnish a large part of the energy required by the body.

There are a great many kinds of nitrogenous compounds in flesh, and an almost hopeless confusion exists in their classification and in the names assigned to the various classes by different chemists. I want, however, when I come to speak about the cooking, that you should be familiar with two or three of these classes, so I am going to bore you a little with some facts. Chemists are quite generally agreed in designating the total nitrogenous substance as protein. All the nitrogenous substances are called protein, and under that term is covered a large number of chemical substances. The protein we may subdivide into three classes,—albuminoids, or albumen like substances, as the white of an egg, the curd of milk, the basis of muscle (lean meat,) gluten of wheat, etc.; the gelatinoids, or jelly like materials, and these are so called because when they are treated with boiling water they are changed into a gelatin or glue, glue being simply an impure gelatin; and the nitrogenous extractives. Meat and fish contain very small quantities of so-called extractives. They are the chief ingredients of beef tea and meat extract. Please keep in mind these three classes, albuminoids, gelatinoids, and nitrogenous extractives.

The lean of meat has, in round numbers, about twenty per cent. of protein, or, weight for weight, about five times as much as milk. The flesh of fowls, especially wild fowl, has on the average more protein than beef, and the flesh of fish has less. While protein is the most important and valuable ingredient of food, lean flesh is, nevertheless, a one-sided diet, and to make a well-balanced ration for man the addition of foods containing carbon, such as fat, starches, sugar, etc., is necessary.

Although carbohydrates occur in considerable quantities in other foods, flesh contains but a small amount—only a fraction of one per cent.—and that chiefly in the form of glycogen or muscle sugar. In some of the organs, notably the liver, there are considerable quantities of glycogen. Meats also contain more or less of mineral matters (ash) which have value as food. The most important of these are the phosphates of potash, lime, and magnesia. They are used chiefly in the formation of bone.

THE QUALITY OF MEAT.

Whether meats are tough or tender depends upon two things: the character of the walls of the muscle tubes and the character of the connective tissues which bind the tubes and muscles together. In young and well-nourished animals the tube walls are thin and delicate, and the connective tissue is small in amount. As the animals grow older or are made to work (and this is particularly true in the case of poorly nourished animals) the walls of the muscle tubes and the connective tissues become thick and hard. This is the reason why the flesh of young, well-fed animals is tender and easily masticated, while the flesh of old, hard-worked, or poorly fed animals is often so tough that prolonged boiling or roasting seems to have but little effect upon it. The toughness or tenderness of meat, as has been stated, is dependent upon the walls of the muscle tubes and the connective tissue. The flavor, however, depends largely upon the kinds and amounts of "nitrogenous extractives" which the tubes contain. Pork and mutton are deficient in extractives, and what flavor they possess is due largely to the fats contained in them. The flesh of birds and of most game is very rich in extractives, which accounts for its high flavor. In general the flavor of any particular meat is largely modified by the condition of the animal when slaughtered, and by its food, age, breed, etc.

With the exception of fish, the flesh of animals which feed exclusively upon fish or flesh, has a strong, disagreeable taste, and is eaten only by uncivilized people or those in great need. As regards ordinary meat, however, it is enough to say that the nitrogenous extractives, and hence the flavor, depend mainly upon the age of the animal and the character of its food.

PREPARATION OF FOOD—COOKING.

Uncivilized man differs from civilized man in no more striking way than in the preparation of food. The former takes his nourishment as it is offered by nature; the latter prepares his food before eating, and in ways which are the more perfect the higher his culture.

Meat is rarely eaten raw by civilized people. For the most part it is either roasted, stewed, fried, or boiled. Among the chief objects of cooking are the loosening and softening of the tissues, which facilitates digestion by exposing them more fully to the action of the digestive juices. Another important object is to kill parasites, and thus render harmless organisms that might otherwise expose the eater to great risks. Minor, but by no means unimportant, objects are the coagulation of the albumen and blood so as to render the meat more acceptable to the sight, and the development and improvement of the natural flavor, which is often accomplished in part by the addition of condiments. In general it is probably true that cooking diminishes the ease of digestion of most meats. Cooking certainly cannot add to the amount of nutritive material in meat; and it may remove considerable quantities of the nutrients. The mineral matters are not affected by cooking except that in boiling and stewing more or less of them go into solution. Unless they are heated above their dissociation temperature, at which they break up into other compounds, the fats are not affected in ordinary cooking. The peculiar flavor which we get from meats which are cooked too rapidly is due to the separation of the component parts of the fat. The fat is composed of a base and an acid; for instance, stearine is composed of stearic acid and glycerine, and when heated too hot it will be broken up into stearic acid and glycerine.

EFFECT OF HEAT ON MEATS.

For the purpose of studying the effect of heat upon animal foods they may be considered to consist of albumen, fibrin, gelatin, and the meat juices. Fibrin is an albuminoid, but not like albumen. Albumen is one of the most important, if not the most important, material of animal food. It is represented in vegetables by a corresponding nutritive constituent. The white of egg is practically pure albumen. The yolk is composed chiefly of albumen, although it contains some special constituents, especially a peculiar oil, mixed with the albumen.

To illustrate some of the changes which take place in the cooking of albumen, we may consider the case of cooking an egg in hot water. The changes in this case are visible and simple. As is well known, when an egg is immersed for a few minutes in boiling water, the albumen is converted into a white solid. By careful experiment it has been found that when albumen is heated to 134 degrees Fahrenheit, white fibers begin to appear in it, and at 160 degrees the whole mass becomes white and nearly opaque. When heated to this point it is a semi-solid; is tender, delicate, and jelly-like, and very readily digested. If the heat be increased to the boiling point of water (212 degrees,) and kept for a few minutes at this temperature, the albumen will become hard, and if long continued it will become dry and horny. If one doubts the difference between an egg cooked at a temperature of 160 to 180 degrees, and one cooked in the ordinary way at the boiling point of water, he can easily satisfy himself of the difference by taking two eggs, cooking one in the orthodox manner, from three and one-half to four minutes in boiling water, and placing the other in boiling water, but removing the dish from the fire and leaving the egg in the water for ten minutes or more. When eggs are cooked in the ordinary way, the three and one-half minutes usually allowed is not enough to allow the heat to pass fully to the middle of the egg, and in this case the white is subjected to a higher temperature than is the yolk. A comparison of results will show that the egg which has been cooked at a temperature of thirty degrees or more below the boiling point of water is tender and delicate throughout, while the white of the egg cooked at the boiling point of water has become coagulated, and indeed hard and firm. It will be seen by this that raising the temperature of albumen as high as that of boiling water hardens or coagulates it, while cooking it at a temperature considerably below the boiling point of water renders it a jelly-like, soft material. The egg cooked in three and one-half minutes is not soft boiled, because the yolk is not cooked at all, while the albumen is hard. A soft boiled egg, strictly speaking, is one cooked at a temperature of 160 degrees. One of the great differences between a tender, juicy steak, and a tough, leathery one, is due to its cooking. The one which has been dried up in cooking represents the white of the egg which has been cooked at a temperature of boiling water, while the other is similar to the egg which has been cooked at a temperature between 160 and 180.

Gelatin is a very important ingredient of animal food, and, in fact, is the main constituent of animal tissue, the cell walls being nearly all composed of gelatin. It is said that half of the solid parts of the animal body are convertible by boiling with water into gelatin. There are various forms of gelatin in the body which differ more or less the one from the other.

In the lean of meat there are the semi-liquid albumen, the gelatin, membranes, sheaths, and walls of the muscle fiber and the muscle fiber itself. The muscle fiber, or fibrin, may be considered to be between albumen and gelatin. It is coagulable like albumen and is also somewhat soluble like gelatin.

The meat juices, other than the albumen—which is, strictly speaking, not a juice, though when raw it is semi-liquid—contain mineral salts and creatin and creatinin. The two last give the peculiar "meaty" flavor, and are found only in the juices of the flesh. They are freely soluble in hot or cold water. They are highly nitrogenous, but do not directly serve the purposes of nutrition. They somewhat resemble the alkaloids, theine and caffeine, upon which depends the stimulating effect of tea and coffee.

COOKING BY BOILING.

There is, perhaps, no one subject upon which cook book authorities disagree more than upon the methods to be employed in boiling meats. Taking up cook books at random, one will about as often find directions to place meats in cold water and bring them slowly to a boil as they will find to plunge them directly into boiling water. Which of these two methods is the proper one is not a very difficult matter to decide. Confining our attention to the albumen alone, we can readily see what would happen if this were put into cold water and slowly brought to a boil. The albumen exists in animal foods in a liquid or semi-liquid state, somewhat resembling the white of an uncooked egg. Cold water would dissolve out part of the albumen, and when boiling commenced a scum would be observed on the top of the water. This scum is the dissolved albumen, which, by the boiling water, has become coagulated and rendered hard and insoluble. The amount of the loss of albumen would depend upon the amount of surface and the length of time the meat was exposed to the action of water below 160 degrees. This loss of albumen indicates the desirability of plunging the meats to be cooked into water hot enough to immediately coagulate the albumen on the outer portion of the meat, and in this way stop up the pores so that the albuminoid juices inside cannot exude. There are besides the albumen other juices in which are held the flavoring materials of the flesh, and which are of undoubted food value when taken in connection with the other constituents of animal food. Without them animal food is quite tasteless and nearly valueless. It must be kept in mind, however, that, while these meat juices when taken in connection with the other parts of the meat are of great importance, they cannot by themselves be considered as concentrated nutrients.

If it is desired to heat the meat enough to kill parasites or bacteria in the inner portions of the cut, the piece must be exposed to the action of heat for a long time. Ordinary methods of cooking are seldom sufficient. In a piece of meat weighing ten pounds the temperature of the interior, after boiling four hours, was only 190 degrees F. The inner temperature of meat when roasting has been observed to vary from 160 to 200 degrees F., according to the size of the piece.

If meat is placed in cold water, part of the organic salts, the soluble albumen, and the extractives or flavoring matters will be dissolved out. At the same time small portions of lactic acid are formed, which act upon the meat and change some of the insoluble matters into materials which may also be dissolved out. The extent of this action and the quantity of materials which actually go into the solution depend upon three things: the amount of surface exposed to the water, the temperature of the water, and the length of the time of the exposure. The smaller the pieces, the longer the time, or the hotter the water, the richer will be the broth and the poorer the meat. If the water is heated gradually, more and more of the soluble materials are dissolved. At a temperature of 134 degrees F. the soluble albumen will begin to coagulate, and at 160 degrees

F. the dissolved albumen will rise as a brownish scum to the top and the liquid will become clear.

The foregoing statements will be of much help in the rational cooking of meats in water. The treatment depends largely upon what it is desired to do. It is impossible to make a rich broth and have a juicy, highly flavored piece of boiled meat at the same time. If the meat alone is to be used the cooking in water should be as follows: Plunge the cut at once into a generous supply of boiling water and keep the water at the boiling point, or as near boiling as possible, for ten minutes, in order to coagulate the albumen and seal the pores of the meat; the coating thus formed will prevent the solvent action of the water and the escape of the soluble albumen and juices from the inner portions of the meat. But if the action of the boiling water should be continued, the whole interior of the meat would, in time, be brought near the temperature of boiling water, and all the albumen would be coagulated and rendered hard. Instead of keeping the water at the boiling point (212 degrees F.,) therefore, the temperature should be allowed to fall to about 180 degrees F., when the meat could be thoroughly cooked without becoming hard. A longer time will be required for cooking meat in this way, but the albumen will not be firmly coagulated, and the flesh will be tender and juicy instead of tough and dry, as will be the case when the water is kept boiling, or nearly boiling, during the entire time of cooking.

I want to say just one other thing about boiling water. Most women will not agree with me, but water that is boiling is just as hot as you can possibly get it in an open dish, and water that is just barely bubbling is boiling water. What we ordinarily call simmering is simply to keep the water barely bubbling, and what we call boiling is to keep the bubbles coming up very fast. The effect on cooking is the same in the one case as in the other.

Ques. Does the addition of salt have a tendency to raise the temperature?

Ans. Yes, sir. It does have this tendency, although it will not carry the boiling point more than half a degree higher, probably.

STEWING.

If both the broth and the meat are to be used, the process of cooking should be quite different from that outlined for boiling meat. In stewing, the meat should be cut into small pieces, so as to present relatively as large a surface as possible, and, instead of being quickly plunged into hot water, should be put into cold water in order that much of the juices and flavoring materials may be dissolved. The temperature should then be slowly raised until it reaches about 180 degrees F., where it should be kept for some hours. Treated in this way, the broth will be rich and the meat still tender and juicy. If the water is made much hotter than 180 degrees F. the meat will be dry and fibrous. It is true that if a high temperature is maintained long enough the connective tissues will be changed to gelatin and partly dissolved away, and the meat will apparently be so tender that if touched with a fork it will fall to pieces. It will be discovered, however, that no matter how easily the fibers come apart, they offer considerable resistance to mastication. The albumen and fibrin have become thoroughly coagulated, and while the fibers have separated from each other the prolonged boiling has only made them drier and firmer.

PREPARATION OF SOUPS.

A clear soup as prepared in a proper way from bones, and the adhering part of meat, will contain the flavoring extracts of the meat and more or less of the gelatin of the bones which has been dissolved. In order to extract the largest possible amount of gelatin from the bones, long heating at or near the boiling point is necessary. In the preparation of glue from bones, and glue is merely impure gelatin, the bones are subjected to superheated steam, that is, to steam the temperature of which is considerably above that of the boiling point of water. In this way all, or nearly all, of the gelatin is obtained. The nearer this can be approached in making clear soup, the more complete will be the extraction of the gelatin from the bones. Obviously this will be done at the expense of the albumen and other coagulable materials of the flesh, since, as we have seen, these are rendered hard and insoluble at the boiling point of water. Clear soup will then consist very largely of gelatin, with more or less of the flavoring extracts of the meat. A few years since, this gelatin was supposed to be of very little nutritive value, but there is no question but that it has considerable food value. If, when eaten, clear soups are reinforced by starchy materials such as sago, pearl barley, etc., or better still, by nitrogenous materials, such as macaroni, and best of all, cheese, either skim milk or whole, it has a good deal of nutritive value. I want to say to the ladies that those of you who have not learned how to put grated cheese into soups, should take hold of this idea. The nutritive value of the soups will be increased very much.

MEAT EXTRACTS.

The so-called soup commission of the French academy reported that soup prepared from bones had no nutritive value. Baron Liebig took up this idea and was its most earnest advocate. He was the first of the chemists to study the chemistry of the food of man very much. And since, according to the returns of that commission, it had been shown, though erroneously as we now know, that gelatin had little or no food value, he attached exceeding importance to the flavoring extracts of the meat. In consequence, that which is known in the trade as Liebig's extract of meat, was put upon the market, upon the label of which it is stated that this can contains the nutritive material of a large amount of beef. In reality the can contents represent little other than the flavoring extracts obtained from that quantity of beef, together with more or less of the mineral salts. The extracts thus prepared contain little else than stimulants and do not act as food at all. The term meat extract is commonly applied to a large number of preparations of very different character. They may be conveniently divided into three classes: (1) True meat extracts; (2) Meat juice obtained by pressure and preserved, compounds which contain dried pulverized meat, and similar preparations; (3) Albumose or peptose preparations, commonly called predigested foods.

The true meat extract, if pure, contains little else besides the flavoring matters of the meat from which it is prepared, together with such mineral salts as may be dissolved out. It should contain no gelatin or fat, and cannot, from the way in which it is made, contain any albumen. It is, therefore, not a food at all, but a stimulant, and should be classed with tea, coffee, and other allied substances. It should never be administered to the sick except as directed by competent medical advice. Its strong, meaty taste is deceptive, and the person depending upon it alone for food would certainly die of starvation. Such meat extracts are often found useful in the kitchen for flavoring soups, sauces, etc. Broth and beef tea as prepared ordinarily in the household contain more or less protein, gelatin, and fat, and therefore are foods as well as stimulants. The proportion of water in such compounds is always very large.

The preserved meat juice and similar preparations contain more or less protein, and therefore have some value as food.

The third class of preparations is comparatively new. The better ones are really what they claim to be—predigested foods. They contain the soluble albumoses (peptoses,) etc., which are obtained from meat by artificial digestion. The use of such preparations should be regulated by competent medical advice.

FOOD PUBLICATIONS.

Now in case any of you are interested in this subject, let me tell you two or three things which you may be glad to know. The United States Department of Agriculture is making these food investigations under the charge of Prof. Atwater, and the Department issues certain publications. Some of these publications bearing upon this subject can be obtained either by applying directly to the Secretary of Agriculture at Washington, or to your Congressman. There are two publications, one "Foods, Nutritive Value and Cost," by Prof. Atwater (that is Farmers' Bulletin No. 23, of the U. S. Department of Agriculture), another "Meats; Composition and Cooking," which bear very much upon what I have been trying to tell you this afternoon. In case any of you would like these two publications, if you will give your names to Secretary McKeen, or will send them to me, we will see that they are forwarded to you. If I had known early enough that I was coming here, I would have brought them. These are the so-called Farmers' Bulletins, which the Department of Agriculture wishes to put into the hands of everyone who wants them.

ABSTRACT

OF

CATTLE COMMISSIONERS' REPORT.

To His Excellency, the Governor of Maine:

We present our bi-annual report of the year closing December 31, 1896, together with an account of our appraisals of horses and cattle destroyed under provisions of the law of 1887, chapter 177, relating to contagious diseases in this State, and as amended in 1892, chapter 194:

The first inspection of the year was ordered at Hartland, where on January 1st, a milch cow was condemned and destroyed. Appraisal, $50.

January 3rd. Herd of cattle inspected at Gorham, but no contagious disease found.

January 4th, East Otisfield. A case of tuberculosis was discovered in a grade Holstein cow. Appraisal, $50.

January 9th, Brunswick. Inspection of cattle, but no contagious disease discovered.

January 10th, Orrington. Inspection of herd of cattle, but no disease found to exist.

January 11th, Livermore Falls. Inspection of herd of cattle was made and tuberculin test ordered.

January 12th, Bangor. A case of glanders was reported, but none was discovered.

January 14th, West Buxton. A case of tuberculosis was reported, but none discovered.

January 15th, Waterboro. A case of tuberculosis was reported which proved to be emphysema.

January 16th, Hermon. A case of tuberculosis was reported, but none was found.

January 17th, Farmington. Inspection of herd of cattle, and bull found diseased. Appraisal, $25.

January 18th, East Otisfield. A case of tuberculosis was reported, but no case was found.

January 22d, West Ripley. Herd of cattle inspected and an ox found badly diseased. Appraisal, $50.

January 24th, West Auburn. A case of glanders was reported, but none discovered.

January 25th, Windham. Herd of cattle inspected and grade Jersey cow found diseased. Appraisal, $25.

January 27th, Winslow. Inspection ordered of herd of milch cows, but no disease discovered.

January 28th, Fryeburg. Inspection of herd of cattle, but no disease discovered.

January 29th, Canton Point. Inspection of herd of cattle ordered, and Jersey heifer condemned. Appraisal, $20.

January 29th, Belfast. Inspection of herd of cattle ordered, but no contagious disease found.

January 29th, Bangor. A case of tuberculosis was reported, but none discovered.

January 30th, Eliot. A case of tuberculosis was reported, but none discovered.

January 31st, New Gluocester. Herd of cattle was inspected and Jersey cow condemned. Appraisal, $30.

January 31st. Inspection of cattle was ordered at Bridgton and tuberculin tests ordered.

February 1st. Inspection of herd at Norway disclosed two cows affected with tuberculosis. Appraisal, $75.

February 4th. Inspection of cattle at Bridgton disclosed fifteen cows, one bull and six calves affected with tuberculosis. Appraisal, $780.

February 5th, East Otisfield. A grade cow was found affected and condemned. Appraisal, $50.

February 6th, Troy. An old cow was found diseased and condemned at an appraisal of $13.

February 7th, West Falmouth. Inspection of cattle was ordered, but no contagious disease found.

February 8th, Farmington. A herd of cattle was examined, but no disease found.

February 9th, East Dixfield. A case of tuberculosis was found in a grade cow. Appraisal, $50.

February 13th, Readfield. A case of tuberculosis was reported, which proved to be emphysema.

February 14th, Minot. A case of tuberculosis was found in a grade cow. Appraisal, $40.

February 15th, Solon. A case of tuberculosis was discovered in an ox. Appraisal, $50.

February 15th, Fairfield. A case of glanders was reported, but none discovered.

February 17th, Gorham. A herd of cattle was inspected and a grade cow found diseased. Appraisal, $20.

February 18th, Lewiston. A herd of cattle was inspected, but no contagious disease discovered.

February 19th, Ellsworth. A case of tuberculosis was reported, but none found.

February 19th, South Sanford. A herd of cattle was inspected and an ox found with chronic pneumonia.

February 20th, Fairfield Centre. A herd of cattle was inspected, but no disease discovered.

February 20th, North Bangor. A case of glanders was reported, but none discovered.

February 22d, East Lebanon. A cow was found affected with tuberculosis and condemned. Appraisal, $30.

February 23rd, Monroe. A case of tuberculosis was reported, but none discovered.

February 24th, Carmel. A case of tuberculosis was reported, but none discovered.

February 25th, Norway Lake. A herd of cattle was inspected and two grade cows condemned. Appraisal, $100.

February 25th, Norway. A cow was reported diseased, but no contagious disease found.

February 25th, Carmel. A case of tuberculosis was reported, but none discovered.

February 26th, Livermore Falls. A herd of cattle was inspected, and a thoroughbred Jersey bull found affected with tuberculosis. Appraisal, $50.

February 27th, Hampden. A case of tuberculosis was reported, but none discovered.

February 29th, Readfield. A herd of cattle was inspected, but no contagious disease found.

March 5th, Fayette. A herd of cattle was inspected, but no contagious disease discovered.

March 6th, Canton. A herd of Jerseys was inspected and tuberculin tests ordered.

March 10th, Oxford. A cow was found affected with tuberculosis and killed with no appraisal.

March 11th, Gray. A cow was found affected with tuberculosis. Appraisal, $30.

March 12th, Readfield. A case of tuberculosis was reported, but none discovered.

March 13th, Bridgton. A herd of cattle was inspected, but no new cases discovered.

March 14th, East North Yarmouth. A case of glanders was reported, but proved to be catarrh.

March 15th, Old Town. A horse was found affected with glanders. Appraisal, $50.

March 17th, Deering. A herd of milch cows was inspected, but no disease discovered.

March 18th, Kennebunk. A herd of cattle was inspected, but no disease discovered.

March 19th, Kittery. A herd of cattle was inspected, but no contagious disease found.

March 19th, Bridgton. A herd of milch cows was examined and two Jersey cows found diseased. Appraisal, $100.

March 21st, Long Creek. A herd of milch cows was inspected but no disease discovered.

March 22nd, Deering. A herd of cows was inspected, but none found diseased.

March 24th, Belfast. A flock of sheep and cattle was inspected and quarantined.

March 25th, Eliot. A herd of cattle was inspected and quarantined.

March 26th, Deering. A Western horse was found affected with farcy. Appraisal, $50.

March 26th, Peru. Cattle were inspected, but none found diseased.

March 27th, Otisfield. A grade cow was found affected with tuberculosis. Appraisal, $30.

March 28th, Portland. A bad case of farcy was discovered and condemned. Appraisal, $50.

April 2nd, Unity. Contagious disease was reported in a herd of cattle, but none discovered.

April 3rd, Yarmouthville. A herd of cattle was inspected, but no disease discovered.

April 6th, Deering. A case of tuberculosis was reported, but none found to exist.

April 7th, Buxton. A herd of cattle was inspected, but no disease discovered.

April 7th, Topsham. A case of tuberculosis was reported which proved to be pneumonia.

April 8th, South Portland. State Reform School herd was tested with tuberculin and one case found affected with tuberculosis. No appraisal.

April 11th, Hebron. A flock of sheep was inspected, and found affected with a parasitic disease, known as esophagostoma columbianum.

April 14th, Saco. A case of tuberculosis was reported in a grade cow and condemned. Appraisal, $30.

April 15th, Thorndike. A cow was discovered affected with tuberculosis and appraised $25.

April 16th, Standish. A case of tuberculosis was discovered in an ox. Appraisal, $50.

April 17th, East Raymond. A case of glanders was reported, but proved to be catarrh.

April 18th, Gray. A case of tuberculosis was reported which proved to be emphysema.

April 18th, Saco. A case of tuberculosis was discovered in a grade Jersey cow. Appraisal, $20.

April 20th, Pleasantdale. A case of glanders was discovered and destroyed. Appraisal, $50.

April 21st, Portland. A case of farcy was discovered and condemned. Appraisal, $50.

April 22d, Saco. A case of glanders was reported which proved to be catarrh.

April 22d, North Carmel. A herd of cattle was inspected, but no disease found.

April 23d, Weston's Mills. A case of tuberculosis was discovered in a grade cow. Appraisal, $44.

April 24th, Bucksport. Tuberculosis was reported in a Jersey cow and found diseased. Appraisal, $40.

April 25th, Portland. A case of glanders was reported, which proved to be catarrh.

April 25th, Cumberland Mills. A herd of cattle was inspected, but no disease found.

April 27th, Leeds Center. A case of tuberculosis was discovered in an old Jersey cow. Appraisal, $20.

April 28th, Farmington. A case of tuberculosis was found in a cow recently from Massachusetts, and condemned with no appraisal.

May 1st, South Portland. A case of glanders was discovered in a Western horse. Appraisal, $50.

May 2d, Orland. A case of tuberculosis was discovered in a grade cow, but no case found.

May 4th, Kennebunkport. An ox was reported to have tuberculosis, but no case discovered.

May 6th, Sweden. A herd of cattle was inspected and quarantine ordered.

May 9th, Livermore. A herd of cattle was inspected and four calves found dead, affected with anthrax. Appraisal, $40.

May 9th, Troy. A case of tuberculosis was reported, but none discovered.

May 10th, Hermon. A case of tuberculosis was reported, but none discovered.

May 11th, Kittery. Herd of cattle inspected and two cows condemned. Appraisal, $95.

May 12th, Carmel. A case of tuberculosis was reported, but none discovered.

May 13th, Deering. A case of glanders was discovered in a Western horse. Appraisal, $50.

May 13th, Winterport. A case of tuberculosis was discovered in a grade cow. Appraisal, $35.

May 14th, Sweden. Herd of cattle inspected and three cows condemned. Appraisal, $100.

May 15th, South China. A herd of cattle was inspected, but no contagious disease found.

May 15th, Norway. A case of tuberculosis was discovered and condemned. Appraisal, $30.

May 16th, Skowhegan. Glanders was reported in a livery stable, and two horses found affected and condemned. Appraisal, $100.

May 16th, Mattawamkeag. A case of tuberculosis was reported, but none discovered.

May 18th, Kittery. Two herds of cattle were inspected, and five milch cows found diseased, and were appraised $195.

May 20th, Camden. A case of glanders was reported which proved to be catarrh.

May 22d, Augusta. A case of glanders was discovered and destroyed. Appraisal, $50.

May 22d, Scarboro. A case of tuberculosis was reported, but no case discovered.

May 23d, Skowhegan. A case of glanders was discovered and destroyed. Appraisal, $50.

May 23d, North Newburg. A case of tuberculosis was discovered and condemned. Appraisal, $30.

May 24th, East Poland. A case of tuberculosis was discovered and condemned. Appraisal, $30.

May 25th, Clinton. A case of tuberculosis was reported, but none discovered.

May 28th, West Hampden. A case of tuberculosis was reported, but none discovered.

May 29th, Canton. A herd of cattle were inspected and two thoroughbred Jersey cows found affected and condemned. Appraisal, $150.

June 1st, Berwick. Two cases of glanders were reported, and stable ordered quarantined.

June 1st, Danville. Herd of cattle inspected and Holstein bull condemned. Appraisal, $40.

June 2d, Bangor. A case of tuberculosis was discovered and condemned. Appraisal, $30.

June 3d, Cape Elizabeth. A case of glanders was discovered in a Western horse. Appraisal, $50.

June 3d, Bangor. A case of glanders was discovered and destroyed. Appraisal, $50.

June 4th, Portland. A case of glanders was reported, but none discovered.

June 5th, Lewiston. Glanders was reported in a stable, and two horses condemned. Appraisal, $100.

June 6th, Norway. Inspection of a herd of milch cows disclosed no contagious disease.

June 6th, Dedham. A case of tuberculosis was discovered and condemned. Appraisal, $30.

June 7th, North Bradford. A case of tuberculosis was discovered and condemned. Appraisal, $40.

June 8th, Old Orchard. A herd of cattle was inspected and quarantine ordered.

June 9th, Portland. A case of glanders was reported, but none discovered.

June 10th, Lewiston. A case of farcy was reported and condemned. Appraisal, $50.

June 10th, Bangor. A case of tuberculosis was reported, but no case was found.

June 11th, Pea Cove. A case of tuberculosis was discovered in a grade cow. Appraisal, $42.

June 11th, Old Orchard. Inspection of cattle was ordered in two herds, but no disease found.

June 12th, Canton. A thoroughbred Jersey cow was found affected in a large herd. Appraisal, $100.

June 13th, Norway. A herd of milch cows was inspected and three found diseased. Appraisal, $140.

June 14th, Monmouth. A herd of cattle was examined, but no contagious disease found.

June 15th, Farmington. A case of tuberculosis was reported, but none discovered.

June 15th, West Bangor. A case of tuberculosis was reported, but none discovered.

June 16th, Frankfort. A case of tuberculosis was reported, but none discovered.

June 16th, Kittery. A herd of milch cows was inspected and three cows destroyed. Appraisal, $150.

June 17th, Berwick. Two cases of glanders were discovered and destroyed. Appraisal, $95.

June 18th, Lewiston. A case of glanders was discovered and destroyed. Appraisal, $50.

June 19th, Unity. A herd of cattle was inspected, but no disease found.

June 19, Madison. A case of glanders was reported and horse quarantined.

June 20th, Goodwin's Mills. A case of tuberculosis was discovered and condemned. Appraisal, $44.

June 22d, Portland. A case of farcy was discovered and destroyed. Appraisal, $50.

June 22d, Fryeburg. Inspection of two carloads of cattle; discovered no disease.

June 23d, Danforth Cove. A case of glanders was reported, but none discovered.

June 23d, Bangor. A case of glanders was reported, but none discovered.

June 24th, Cape Elizabeth. A case of glanders was reported, but none discovered.

June 27th, Lewiston. Two cases of glanders were discovered and destroyed. Appraisal, $100.

June 28th, Old Town. A case of glanders was reported, but none discovered.

June 29th, Eliot. A case of tuberculosis was discovered and destroyed. Appraisal, $50.

July 2d, Saco. A case of tuberculosis was discovered and destroyed. Appraisal, $40.

July 3d, Old Orchard. A case of tuberculosis was discovered and destroyed. Appraisal, $50.

July 3d, Skowhegan. A case of glanders was discovered and condemned. Appraisal, $40.

July 4th, Old Orchard. A herd of cattle was inspected and eight cows, one bull, and two calves were found diseased and destroyed. Appraisal, $345.

July 4th, Norway. A case of tuberculosis was discovered and destroyed. Appraisal, $35.

July 5th, Dixmont. A case of tuberculosis was reported, but none discovered.

July 5th, Gorham. A case of tuberculosis was reported, which proved to be emphysema.

July 6th, Bridgton. A case of tuberculosis was discovered and destroyed. Appraisal, $45.

July 7th, South Auburn. A case of tuberculosis was discovered and destroyed. Appraisal, $25.

July 8th, Kennebunk. A herd of cattle was inspected, but no contagious disease found.

July 9th, Waterboro. A herd of cattle was inspected, but no contagious disease found.

July 10th, Old Orchard. A herd of cattle was inspected, but no disease found to exist.

July 11th, East Vassalboro. A herd of milch cows was inspected, but none found diseased.

July 13th, Athens. A herd of cattle was inspected, but no contagious disease found.

July 13th, Saco. A case of tuberculosis was discovered and destroyed. Appraisal, $40.

July 14th, Saco. A case of tuberculosis was discovered and destroyed. Appraisal, $35.

July 15th, Kingfield. A herd of cattle was inspected, but no contagious disease discovered.

July 15th, Cash Corner. A case of glanders was discovered and condemned. Appraisal, $25.

July 16th, Monmouth. A case of glanders was discovered and condemned. Appraisal, $35.

July 17th, Saco. A case of tuberculosis was discovered and destroyed. Appraisal, $35.

July 17th, Hartland. A case of glanders was reported but proved to be catarrh.

July 18th, Old Orchard. A case of tuberculosis was discovered and destroyed. Appraisal, $40.

July 19th, Passadumkeag. A case of tuberculosis was reported, but none found.

July 19th, Danville. A case of tuberculosis was discovered and condemned. Appraisal, $25.

July 20th, Newfield. A case of tuberculosis was reported, but no case discovered.

July 20th, Turner Centre. A herd of cattle was inspected, but no disease discovered.

July 21st, Knightville. A case of farcy was reported, but none found on testing to exist.

July 21st, Eliot. A case of tuberculosis was discovered and destroyed. Appraisal, $50.

July 22d, South Portland. A herd of cattle was inspected but none found diseased.

July 23d, South Paris. A case of tuberculosis was discovered and destroyed. Appraisal, $35.

July 24th, Yarmouth. A case of tuberculosis was discovered and destroyed. Appraisal, $35.

July 24th, South Portland. A case of tuberculosis was discovered and destroyed. Appraisal, $40.

July 25th, Anson. A case of glanders was reported, but proved to be chronic catarrh.

July 26th, East Poland. A case of tuberculosis was reported, but none discovered.

July 27th, Minot Center. A herd of cattle was inspected and quarantine ordered.

July 28th, Cape Elizabeth. A herd of cattle was inspected, but no new cases discovered.

July 29th, Portland. A case of glanders was discovered and condemned. Appraisal, $25.

July 31st, Portland. A case of glanders was discovered and condemned. Appraisal, $50.

August 3d, Bath. A case of glanders was reported, but none discovered.

August 5th, Albion. A herd of cattle was inspected, but no contagious disease found.

August 6th, Greene. A case of tuberculosis was reported, but none found to exist.

August 7th, West Sumner. A herd of cattle was inspected, but only a case of emphysema found.

August 8th, South Whitefield. A case of tuberculosis was reported, but none discovered.

August 11th, East Livermore. A herd of cattle was inspected, but no disease found.

August 12th, Manchester. A herd of cattle was inspected, but none found diseased.

August 13th, South Portland. A case of glanders was reported which proved to be catarrh.

August 14th, Otisfield Gore. A case of tuberculosis was discovered and destroyed. Appraisal, $30.

August 16th, Porter. A case of tuberculosis was discovered and destroyed. Appraisal, $35.

August 21st, Falmouth. A case of glanders was reported, but none discovered.

August 24th, Macwahoc, Aroostook county. A herd of cattle was inspected, but no disease found.

September 2d, Albion. A herd of cattle was inspected, but none found diseased.

September 3d, Mason. A herd of cattle was examined, but none found diseased.

September 5th, Readfield. A case of tuberculosis was reported, but none found diseased.

September 7th, Cumberland. A case of tuberculosis was reported, but none found.

September 10th, Winter Harbor. A case of glanders was discovered and destroyed. Appraisal, $50.

September 13th, Holden. A case of tuberculosis was discovered and appraised $25.

September 16th, Portland. A case of farcy was reported, but none discovered.

September 18th, Corinth. A case of glanders was discovered and condemned. Appraisal, $50.

September 19th, Portland. A case of glanders was discovered and condemned. Appraisal, $30.

September 20th, Bangor. A case of tuberculosis was reported, but no case discovered.

September 21st, Saco. A case of glanders was discovered and destroyed. Appraisal, $50.

September 22d, Old Orchard. A case of glanders was discovered and destroyed. Appraisal, $50.

September 23d, Gray. A case of glanders was reported, but proved to be catarrh.

September 23d, Minot. A case of tuberculosis was discovered and condemned. Appraisal, $50.

September 25th, West Woolwich. A case of tuberculosis was reported, but none found.

September 25th, Deering. A case of glanders was reported, but proved to be catarrh.

September 26th, Holden. A case of tuberculosis was reported, but none discovered.

September 26th, Five Islands. A case of glanders was reported, which proved to be catarrh.

September 26th, Foster's Point. A case of tuberculosis was reported, but none found.

September 27th, Dayton. A herd of cattle was inspected, but no contagious disease found.

September 30th, Winthrop. A case of glanders was reported, but none found.

October 1st, Fayette. A case of farcy was discovered and condemned. Appraisal, $50.

October 2d, Fryeburg. A case of tuberculosis was discovered and condemned. Appraisal, $18.

October 3d, Hampden. A case of tuberculosis was discovered and condemned. Appraisal, $30.

October 5th, Thorndike. A herd of cattle was inspected, but no disease discovered.

October 6th, Guilford. A herd of cattle was examined and an ox found diseased. Appraisal, $50.

October 7th, Edgecomb. A case of glanders was reported, but none discovered.

October 8th, East Livermore. A case of glanders was reported, but none discovered.

October 10th, Cash's Corner. A case of glanders was discovered and destroyed. Appraisal, $50.

October 12th, North Saco. A herd of cattle was examined, but no disease found.

October 12th, Cape Elizabeth. A case of glanders was reported, which proved to be catarrh.

October 13th, Portland. A case of farcy was reported, but none discovered.

October 14th, Saco. A case of tuberculosis was reported, but none found.

October 15th, Eddington. A case of glanders was reported, but no case found.

October 15th, North Livermore. A case of farcy was reported, but no case found.

October 16th, Auburn. A herd of cows was inspected and a Jersey cow found affected, and was destroyed. Appraisal, $20.

October 22d, Saco. A herd of cattle was inspected and a grade cow found diseased. Appraisal, $40.

October 24th, Portland. A case of glanders was discovered and destroyed. Appraisal, $50.

October 26th, Durham. A case of tuberculosis was discovered and destroyed. Appraisal, $25.

October 26th, Auburn. A herd of milch cows was inspected and quarantine ordered.

October 27th, West Gray. A case of tuberculosis was reported, but no case found.

October 28th, Farmington. A case of tuberculosis was discovered and condemned. Appraisal, $50.

October 30th, Waldoboro. A case of glanders was reported, but no case found.

October 30th, Robinsons. A case of tuberculosis was reported, but no case found.

October 31st, Skowhegan. A case of glanders was discovered and destroyed. Appraisal, $50.

October 31st, Eliot. A case of tuberculosis was discovered and condemned. Appraisal, $35.

November 2d, South Portland. A case of farcy was discovered and condemned. Appraisal, $50.

November 3d, Willard. A case of glanders was discovered and condemned. Appraisal, $50.

November 5th, Lewiston. A herd of cows was inspected and five found diseased. Appraisal, $137.50.

November 6th, Monmouth. A herd of cows was inspected and five found diseased. Appraisal, $245.

November 7th, Hebron. A cow was found affected with tuberculosis and condemned. Appraisal, $10.

November 9th, Auburn. A cow was found affected with tuberculosis and condemned. Appraisal, $25.

November 10th, Westbrook. A herd of cattle was inspected, but no contagious disease found.

November 11th, Guilford. Inspection was ordered of a herd of cows, but no disease existed.

November 12th, Hampden. A case of tuberculosis was discovered and condemned. Appraisal, $20.

November 12th, Wells. A case of tuberculosis was discovered and condemned. Appraisal, $50.

November 13th, East Lebanon. An ox was found affected with tuberculosis and condemned. Appraisal, $25.

November 13th, Lewiston. A case of tuberculosis was discovered and condemned. Appraisal, $50.

November 14th, Willard. A case of glanders was discovered and condemned. Appraisal, $40.

November 14th, Orono. A herd of cows was inspected, but no disease discovered.

November 15th, Charleston. A case of tuberculosis was discovered and condemned. Appraisal, $30.

November 17th, Portland. Two cases of glanders were discovered and condemned. Appraisal, $100.

November 19th, Portland. A case of glanders was reported, but proved to be chronic catarrh.

November 20th, Lincoln Center. Inspection was ordered in a herd of cattle, but no disease discovered.

November 21st, Portland. A case of glanders was reported, and placed in quarantine.

November 23d, East Dover. A case of tuberculosis was discovered and condemned. Appraisal, $20.

November 27th, Deering. A case of glanders was discovered and condemned. Appraisal, $50.

November 28th, Bangor. Inspection was ordered of a herd of cows, but no disease found.

November 29th, North Turner. A case of tuberculosis was discovered and condemned. Appraisal, $25.

December 1st, New Gloucester. A case of tuberculosis was discovered and condemned. Appraisal, $40.

December 2d, Bangor. A case of tuberculosis was discovered and condemned. Appraisal, $30.

December 3d, Lewiston. A case of tuberculosis was discovered and destroyed, with no appraisal.

December 4th, North Berwick. A case of glanders was discovered and destroyed. Appraisal, $50.

December 4th, West Buxton. A case of tuberculosis was discovered and destroyed. Appraisal, $25.

December 5th, Saco. Inspection was ordered in a herd of cows, but no disease was discovered.

December 7th, Springvale. A case of tuberculosis was discovered and destroyed. Appraisal, $30.

December 7th, Unity. A case of tuberculosis was discovered and destroyed. Appraisal, $30.

December 8th, Richmond. A case of glanders was reported, which proved to be chronic catarrh.

December 9th, Kennebunk. Inspection was ordered of a herd of cattle and one animal quarantined.

December 10th, Mechanic Falls. A case of glanders was reported, but none proved to exist.

December 14th, Minot Center. A herd of cows and young stock, fourteen in number, was all found to be affected, more or less, with tuberculosis and was condemned and ordered destroyed. Appraisal, $415.

December 16th, Kennebunk. A case of tuberculosis was discovered and condemned. Appraisal, $50.

December 17th, Winterport. A case of tuberculosis was discovered and destroyed. Appraisal, $30.

December 17th, Saco. Inspection was ordered of a herd of cattle, and two cows and two calves found diseased and were destroyed. Appraisal, $104.00.

December 18th, Portland. A case of glanders was reported, but none discovered.

December 18th, Bangor. A herd of cattle was tested and eleven cows found diseased. Appraisal, $385.

December 19th, Solon. A case of tuberculosis was discovered and destroyed. Appraisal, $25.

December 19th, East Otisfield. Inspection was ordered in a herd of cows, and six condemned and destroyed. Appraisal, $210.

December 20th, Dedham. A case of tuberculosis was reported, but none discovered.

December 21st, Westbrook. A herd of cattle was inspected and placed in quarantine.

December 22d, Springvale. A case of tuberculosis was reported, but none discovered.

December 23d, Westbrook. Herd of cattle was tested and continued in quarantine.

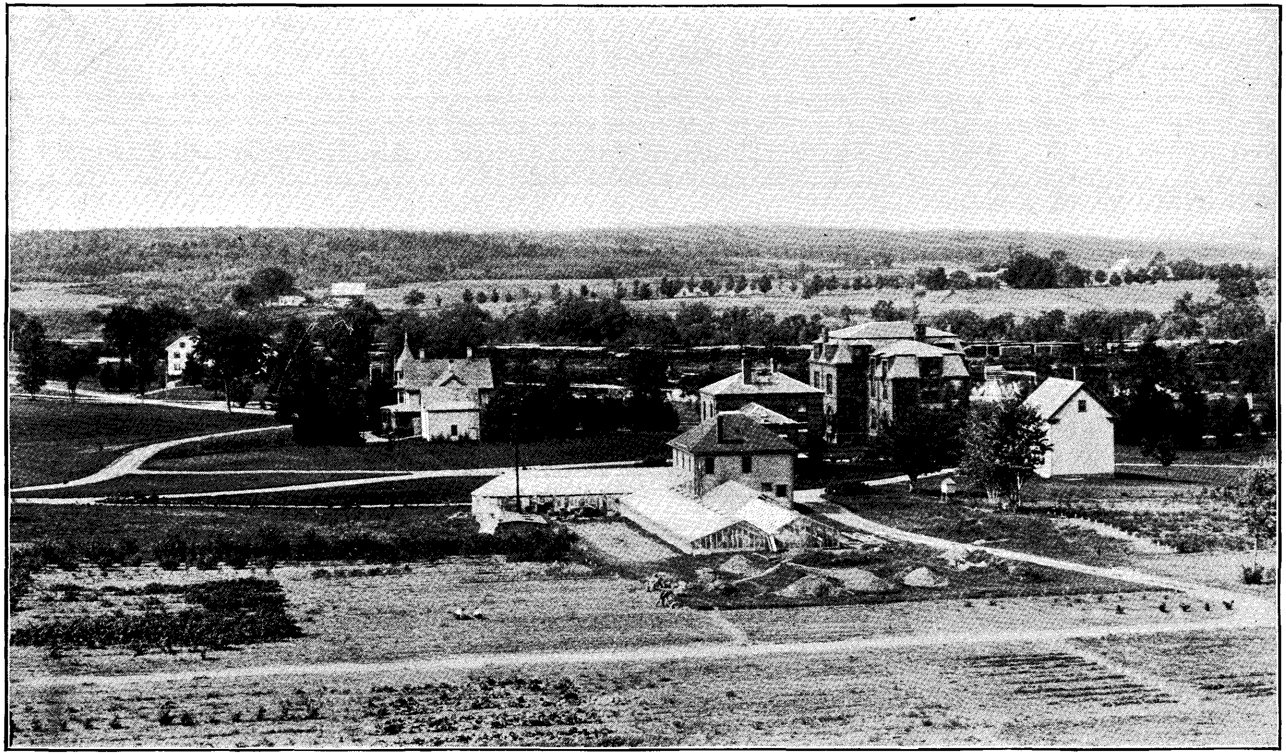
December 24th, Portland. A case of glanders was discovered and condemned. Appraisal, $27.

December 24th, Hampden Center. Inspection was ordered in a herd of cows, and fourteen found diseased and were destroyed. Appraisal, $380.

December 28th, Albion. A herd of cows was inspected, but none found diseased.

A summary of the business of the year shows that your commissioners have ordered and attended over three hundred inspections during 1896, scattered all over our State, containing a cattle population of 328,543, and 110,719 horses either bred or owned upon 65,400 farms in Maine. This amount of work is so largely in excess of the demands upon our services of any other year since the present law went into effect, that it is apparent upon the face of it, that with a total amount of appraisals for the years 1895 and 1896 largely in excess of the whole biannual appropriation, together with the almost certain knowledge that the new and much more certain methods of diagnosing and controlling the disease through the aid of tuberculin tests will compel an increased expenditure of both time and money; that the amount thus far appropriated is entirely insufficient to insure any reasonable or effectual continuance of the work.

In 1895, forty-three head of horses were condemned and destroyed at an appraisal of $1,927.50, and seventy-nine head of cattle were also condemned and destroyed at an appraisal of $2,459, the total amount of appraisals for that year being $4,386. In 1896, forty-five head of horses were condemned and destroyed at an appraisal of $1,967, and 202 head of cattle were also condemned and destroyed at an appraisal of $7,063.50, the total amount of appraisals of the year being $9,030.50, amounting in the two years to $13,416.50 for which was appropriated at the last session of the legislature the sum of ten thousand dollars out of which was expected to be paid all the expenses and pay of three commissioners and for all animals destroyed under the provisions of this act.



GREEN HOUSES AND OFFICES.

ANNUAL REPORT

OF THE

Maine State College Agricultural Experiment Station.

1896.

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

Maine Agricultural Experiment Station,

Orono, Maine.

STATE OF MAINE

A. W. Harris, Sc. D., President Maine State College:

SIR:—I transmit herewith the Twelfth Annual Report of the Maine Agricultural Experiment Station for the year ending December 31, 1896.

CHARLES D. WOODS,
Director.

ORONO, Maine, December 31, 1896.

TABLE OF CONTENTS.

MAINE AGRICULTURAL EXPERIMENT STATION.

THE STATION COUNCIL.

PRESIDENT ABRAM W. HARRIS,	President
DIRECTOR CHARLES D. WOODS,	Secretary
BENJAMIN F. BRIGGS, Auburn,	Committee of Board of Trustees
ARTHUR L. MOORE, Orono,	Committee of Board of Trustees
ELLIOTT WOOD, Winthrop,	Committee of Board of Trustees
B. WALKER McKEEN, Fryeburg,	State Board of Agriculture
ORA O. CROSBY, Albion,	State Grange
CHARLES S. POPE, Manchester,	State Pomological Society
JAMES M. BARTLETT,	Members of the Station Staff
LUCIUS H. MERRILL,	Members of the Station Staff
FRANCIS L. HARVEY,	Members of the Station Staff
FREMONT L. RUSSELL,	Members of the Station Staff
WELTON M. MUNSON,	Members of the Station Staff
GILBERT M. GOWELL,	Members of the Station Staff

THE STATION STAFF.

THE PRESIDENT OF THE COLLEGE.

CHARLES D. WOODS,	Director
JAMES M. BARTLETT,	Chemist
LUCIUS H. MERRILL,	Chemist
FRANCIS L. HARVEY,	Botanist and Entomologist
FREMONT L. RUSSELL,	Veterinarian
WELTON M. MUNSON,	Horticulturist
GILBERT M. GOWELL,	Agriculturist
HENRY B. SLADE,	Assistant Chemist
ORA W. KNIGHT,	Assistant Chemist
LUCIUS J. SHEPARD,	Assistant Horticulturist
MRS. J. HAMLIN WAITE,	Stenographer

REPORT OF THE TREASURER.

Maine Agricultural Experiment Station in account with the United States appropriation, 1895-6:

Dr.

To receipts from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1896, as per act of Congress approved March 2, 1887	$15,000 00

Cr.

By salaries:		
(a) Director and administration officers	$2,150 00	
(b) Scientific staff	4,888 98	
(c) Assistant to scientific staff	2,074 18	
(d) Special and temporary services	227 32	
Total		$9,340 48
Labor:		
(a) Monthly employees	$128 71	
(b) Daily employees	217 54	
(c) Hourly employees	368 12	
Total		714 37
Publications:		
(a) For printing	$349 70	
(c) For envelopes for bulletins and reports	30 00	
(d) Other expenses	19 50	
Total		399 20
Postage and stationery		139 01
Freight and express		204 61
Heat, light and water		381 98
Chemical supplies:		
(a) Chemicals	$120 72	
(b) Other supplies	105 02	
Total		225 74
Seeds, plants, and sundry supplies:		
(a) Agricultural	56 82	
(b) Horticultural	178 91	
(c) Botanical	58 77	
(d) Entomological	1 48	
(e) Miscellaneous	5 25	
Total		301 23

Fertilizers		$ 32 70
Feeding stuffs		340 67
Library		156 09
Tools, implements, and machinery		35 17
Furniture and fixtures		281 32
Scientific apparatus		866 40
Live stock:		
(b) Cattle	$640 00	
(d) Swine	10 00	
Total		650 00
Traveling expenses:		
(a) In supervision of Station work	$134 84	
(b) In attending various meetings	43 50	
Total		178 34
Contingent expenses		233 23
Building and repairs:		
(a) New buildings	$154 61	
(b) Improvements	88 74	
(c) Repairs	276 11	
Total		519 46
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, 1896; 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.

ELLIOTT WOOD, Auditor.

REPORT OF THE DIRECTOR.

CHAS. D. WOODS.

The work of the first half of the year was conducted under the direction of Professor Jordan. With the change of director which took place July 1, 1896, there was little change in the policy of the Station. Its principal lines of work have been the same as in former years and are briefly referred to in the pages which immediately follow. A more detailed report of the work of the Station during the year is given by my associates in the pages beyond.

The Director wishes here to express his appreciation of the kind reception given to him and the loyal co-operation of his associates in prosecuting the work of the Station.

CHANGES OF STATION STAFF.

There have been a number of changes in the station staff during the year. The following concerning the change of director is taken from the report of the President of the College to the Trustees.

"Professor Whitman Howard Jordan, Sc. D., Director of the Experiment Station, resigned his position July 1, 1896, to accept the directorship of the State Experiment Station of New York. It was a matter of sincere regret that we were unable to retain him, but the opportunities and salary offered him in New York were so much greater than he enjoyed here that he could not be expected to stay with us without changes which would cause an increase of our expenses beyond our means. He was a graduate of the college in the class of 1895. After spending some time in the Experiment Station at Middletown, Conn., the first in the United States, and then recently established, he returned to the college as instructor. He served as professor of agriculture for some years in the Pennsylvania State College, and again returned to Orono as director of the Experiment Station."

"Professor Charles Dayton Woods, B. S., who succeeds Professor Jordan, comes to us from the Storrs (Conn.) Experiment Station, of which he was assistant director. He is a graduate of Wesleyan University, and has studied abroad. He was one of the early workers in the first experiment station in the United States. He holds a commission from the United States Government for investigations on human foods."

After a year's leave of absence which was spent in study abroad and at Cornell University, Professor Munson returned to his duties at the Experiment Station, July 1, 1896.

Mr. Fred C. Moulton, M. S., assistant chemist, resigned August 31st. Mr. Henry B. Slade, A. B., a graduate of Brown University, is his successor.

Mr. Harris Perley Gould, B. S., assistant horticulturist, resigned his position August 31, in order to pursue post-graduate studies elsewhere. He has been succeeded by Mr. Lucius Jerry Shepard, B. S., a graduate of the Massachusetts Agricultural College.

Mr. Ora W. Knight, B. S., a graduate of the College, was appointed assistant chemist December 1st.

Mr. A. M. Shaw, foreman of the farm, resigned December 31, 1896.

Professor G. M. Gowell, M. S., has been appointed agriculturist. This appointment will take effect January 1, 1897.

FERTILIZER INSPECTION.

The number of brands of fertilizers sold in the State seems to be steadily on the increase. Old companies are increasing the number of brands they are offering and new companies are entering the State. In 1894 the Station agent collected 60 brands; in 1895 he collected 74; in 1896 the number was 117, and the indications are that the number of brands sold in 1897 will come well up to 150.

Seventy-seven of the 117 brands sold in the State in 1896 were licensed; the remaining 40, according to the representations of the manufacturers, were exempted from the payment of the analysis fee as coming within the thirty ton limit. The terms of the law require, however, that these non-paying brands shall be inspected, consequently it is possible for a manufacturer, by selling a small amount of a large number of brands, to increase the work of inspection entirely out of proportion to the analysis fees paid.

As the cost of the fertilizer inspection must be borne entirely by the receipts from license fees, the inspection of the non-paying brands restricts the proper inspection of the regularly licensed brands. To correct this evil the Station Council proposes to ask the legislature of 1897 to so amend the law that the analysis fee shall apply to every brand sold in the State.*

INSPECTION OF CHEMICAL GLASSWARE USED IN CREAMERIES.

Nearly all the glassware that has been examined during the year has come from dealers in dairy supplies. It is reasonable to suppose, therefore, that the butter factories have renewed their stock by purchasing tested bottles and pipettes direct from the dealers and are complying with the law in that respect.

It has been gratifying to note that a very small percentage of the goods inspected the past year was inaccurately graduated.

During the year 1896 there were received and calibrated 801 cream bottles, 280 milk bottles, and 70 pipettes. Of this large amount of glassware only one cream bottle and five pipettes were found to be sufficiently inaccurate to throw them out. All the milk bottles were correct. The Station has adopted a new stamp, and bottles and pipettes found correct are now marked M. E. S.

The text of the law is printed in another place in this report.

NUTRITION OF PLANTS AND ANIMALS.

The box experiments for the purpose of determining the "foraging power" of certain plants for phosphoric acid have been continued. The results obtained up to the spring of 1896 were published in the report of this Station for 1895.

Field experiments on the growth of forage plants and the effects of fertilizers have been continued along the lines of other years. So far as results of value have been obtained they are given beyond.

* This change was secured by act of legislature and approved by the governor February 24, 1897.

Several feeding experiments with milch cows have been made during the year. The results are reported by Mr. Bartlett in another part of this report.

Digestion experiments with sheep are in progress but are not completed. It is expected that these results will be printed in the report for 1897.

These experiments, involving as they do a great deal of chemical work, are time-consuming in their details, and a not inconsiderable portion of the time of the Station chemists has been given to their carrying out.

INVESTIGATION OF THE NUTRITION OF MAN.

The investigation of the nutrition of man, begun three years ago by the United States Department of Agriculture under a special act of Congress, was placed in the immediate charge of Professor W. O. Atwater of Wesleyan University, Middletown, Conn. The director of this Station was then associated with Professor Atwater and shared in the planning and carrying out of these investigations. On coming to this Station, his commission in the United States Department of Agriculture was continued and he still has an active part in this work.

The study of cereal foods, including experiments in digestibility and metabolism, which are in progress at several experiment stations and colleges, is under the immediate care of the director of this Station. The work at the Maine Station in the study of human food during the year has been chiefly on the digestibility of breads made from entire wheat flour, graham flour, and ordinary bread flour. These experiments are not finished. They involve, in addition to the study of the nutrients, the estimation of the fuel values of the foods and of the undigested residues. The metabolism of matter forms an important part of the investigation. These results will be published in bulletins of the Department of Agriculture. Abstracts of these bulletins giving the results will be printed in later reports of this Station. The present report contains an account of studies made by this Station in 1895.

INVESTIGATIONS WITH THE BOMB CALORIMETER.

The study of the fuel value of cattle food and of the food of man gives very valuable information. The chief uses of food are to build tissue, and to furnish the energy requisite for muscular and other work, and for the maintenance of the body heat. The power of food to supply force to do work and maintain temperature can be measured in terms of potential energy. To do this an apparatus called a calorimeter (heat measure) is used. A new form of bomb calorimeter developed by Professor W. O. Atwater and the director of this Station is described in the report of the Storrs (Conn.) Experiment Station for 1894, pages 135-151. Mr. O. S. Blakeslee, mechanician of the Wesleyan University, has made a bomb calorimeter for this Station. Investigations upon the fuel value of foods and the undigested residues of digestion experiments are in progress. Other studies with the bomb calorimeter are planned.

BOTANY.

The work in botany has been continued much as in previous years. The chief work of investigation is along the lines of (1) the diseases of plants and their remedies; (2) the introduction and distribution of weeds in the State; and (3) the life history of plants in relation to remedial measures. Considerable study of the quality of seeds and their contamination with weed seeds has been made.

ENTOMOLOGY.

The work in entomology is along the same lines as that of other years. It consists of (1) the study of the life history of insects doing injury in the State, so as to learn their most vulnerable points and suggest rational remedies; (2) the study of the insects of Maine as to kinds, distribution and variation from year to year, due to climatic changes, food supply and natural enemies; (3) the preparation of specimens for the cabinet to be used in identifying other specimens readily; and (4) preparations of specimens showing the stages in the life history and work of injurious insects.

THE WORK IN HORTICULTURE.

The work in horticulture has been similar to that of previous years. Studies in plant breeding continue as the most important of the lines of inquiry. This work includes a consideration of plants as affected by different conditions of soil, climate and culture, the effects of crossing and of heredity, as well as the improvement of promising wild types. In the forcing houses the study of the tomato has been continued and the culture of other fruits and vegetables, as the currant, radish and lettuce has received attention.

The small fruit plantation has been extended and the different varieties are coming into bearing. Many of the fruits sent to Aroostook county are beginning to bear. Some of the field notes made by the Horticulturist concerning these are given in another part of this report. Experiments on the propagation and culture of the blueberry from selected wild stock are in progress.

Spraying experiments for apple scab have been continued. The season of 1896 was unfavorable for the growth of scab and the results of the experiments are reserved till further trials have been made.

TUBERCULOSIS IN COWS.

Realizing the importance of a better understanding of this disease, the Station has during the year devoted a good deal of attention to the study of bovine tuberculosis. An affected herd of ten animals has been kept isolated from all other animals under as good hygienic conditions as possible. A small barn, 28x40 feet, was erected for their accommodation. The points being studied are: (1) the progress of the disease in affected animals; (2) the conditions under which tuberculin will cause a rise of temperature in tuberculous animals; and (3) the effect of good hygienic conditions on the progress and outcome of the disease. The work is still in progress and other phases of the disease will be taken up. A report of progress is given by Dr. Russell in another part of this report.

THE FARM.

Since the reorganization of the Station in 1888 it has used one of the college barns and has had under cultivation for experimental and other purposes about fifty acres of the college farm.

The oversight of all the work of instruction and investigation of the Department of Agriculture, with the exception of the college farm, is under the charge of one man in either his capacity as Professor of Agriculture or Director of the Station. It was thought that the best interests of the College in its relation to agriculture would be served by having all of the agricultural work of the College consolidated. This will be accomplished January 1, 1897, at which time the management of the college farm will be turned over to the director of the Experiment Station. This transfer is made with such financial support from the College that the Hatch fund will not be encroached upon either temporarily or permanently. The capital necessary for carrying on the farm is furnished by the College. All expenses of management and instruction will be borne by the College. The station funds will be used as in the past, only to defray the cost of experiments.

The farm will be managed primarily as a dairy farm, although considerable attention will be given to swine, sheep and poultry husbandry. The crops grown will be largely hay, fodder, and silage crops. The management of the farm will be, as in the past, under the immediate charge of Professor Gowell.

REPORTS OF THE STATION STILL AVAILABLE FOR DISTRIBUTION.

The Station has a few hundred copies of the Reports for 1888, 1889, 1890, 1893, 1894 and 1895, which will be sent on application so long as the numbers on hand will allow. The Report of this Station is bound with that of the Secretary of Agriculture, so that anyone having the "Agriculture of Maine" has also the Report of this Station.

In order to guide one in asking for these publications the principal papers in each Report are named below.

Address all requests for publications to

Maine Agricultural Experiment Station,

Orono, Maine.

TABLE OF CONTENTS OF REPORTS OF THIS STATION FOR 1888, 1889, 1890, 1893, 1894, AND 1895.

REPORT FOR 1888.

Inspection of fertilizers. Digestion experiments with sheep. The compounding of rations for farm animals. The composition and digestibility of American feeding stuffs. Tests of varieties of potatoes, oats, barley, and peas. Germanation tests of seeds. Descriptions of the following injurious insects: Round-headed apple-tree borer; Flat-headed apple-tree borer; Oyster-shell bark louse; Apple-tree tent-caterpillar; Forest tent-caterpillar; Fall canker-worm; Eye-spotted bud-moth; Apple-tree aphis; Codling moth; Apple maggot; Ash-gray pinion; Pear-tree slug; Indian cetonia; Plum curculio; Cherry-tree plant-louse; Imported currant-worm; Ivy scale insect; Black swallow-tail butterfly; Eyed elater; Hawthorn tingis; Mourning cloak butterfly; Meal-worm beetle.

REPORT FOR 1889.

Inspection of fertilizers. Composition, digestibility and yield of hay from various grasses. Composition, digestibility and yield of corn-fodder. Composition and value of various commercial feeding stuffs. The comparative digestibility of wheat bran and wheat middlings. Composition and digestibility of pea meal. The value of the digestible matter of good hay as compared with the digestible matter of corn ensilage, for milk production. The value of the digestible matter of ensilage as compared with the digestible matter of hay, for growth. Feeding experiments with swine. Tests of several breeds of dairy cows. Field and pot experiments with fertilizers. Field tests with varieties of barley, oats and peas. Seed germination experiments. Experiments with forage plants. The potato rot. Apple scab. The apple maggot. Insecticides. Hog cholera. Parturient apoplexy, (milk fever). The coefficients of digestibility for protein. Loss of food and manurial value in selling sweet corn.

REPORT FOR 1890.

Inspection of fertilizers. Tests of dairy cows. Mechanical loss of butter fat. Effect of delay in setting milk. The mineral ingredients of milk. The fat globules of milk. Tuberculosis in the college herd. Feeding experiments with colts. Feeding experiments with steers. Feeding experiments with swine. Field experiments with fertilizers. Germination tests of seeds. Spraying experiments. Injurious insects. Meteorological operations.

REPORT FOR 1893.

Investigation of the foraging powers of some agricultural plants for phosphoric acid. The composition of fodders and silage from the corn plant. Digestion experiments with sheep. Corn as a silage crop. Feeding experiments. Feeding experiments with cows. Feeding experiments with swine. Waste of fat in the skimmed milk by the deep-setting process. Notes of cabbages, cauliflowers, tomatoes, egg plants and potatoes. Spraying experiments. Catalogue of Maine fruits. Bean and tomato anthracnose. Potato and beet scab. The Angoumois grain moth; the lime-tree winter-moth; the apple-leaf bucculatrix; the Disippus butterfly; the May beetle; the bean weevil; the pear-blight beetle or shot-borer; the carrot-fly.

REPORT FOR 1894.

Analyses of butter and imitation butter. Field experiments with fertilizers. The profitable amount of seed per acre for corn. Digestion experiments. Feeding experiments. Notes of potatoes and corn. Notes of small fruits and on plant breeding. The orange-colored roestelia or quince rust. Diseases of oats. Night-flowering catchfly. The dichotomous catchfly. Potato scab. The snow flea. The silver fish. The ring-banded soldier-bug. The elm tree bark louse. The gooseberry plant-louse. The oblique-banded carpet beetle. The oak-bark weevil. The fall çanker worm. Tuberculin as a diagnostic agent. Bulletins issued in 1894—Fruit-culture. Spraying experiments. Tomatoes. Cauliflowers. Corn as a silage crop. Potatoes. Tuberculosis and glanders. A scheme for paying for cream, etc. Foraging powers of some agricultural plants.

REPORT FOR 1895.

Investigations on the foraging powers of some agricultural plants for phosphoric acid. The profitable amount of seed per acre for corn. Sunflower heads and blackeye peas as silage crops. Feeding experiments with milch cows. The relation of food to the growth and composition of the bodies of steers. Notes on potatoes, sweet corn, peas and cabbage. Notes on plants and insects. Second blooming of pear trees. Cattle lice. The yellow woolly bear. Tapestry moth. The strawberry leaf beetle. The cucumber flea beetle. The currant fly. Bulletins issued in 1895—Important facts about corn. Inspection of fertilizers. A Discussion of certain commercial fertilizers. A discussion of certain commercial foods. Notes on small fruits. Inspection of fertilizers.

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One Iron Age Sulky Cultivator.—Bateman Mfg. Co., Greenlock, New Jersey.

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One package Insecticide, Bug Death.—Danforth Chemical Co., Leominster, Mass.

One gallon prepared putty.—T. H. Nevins, Pittsburg, Pa.

One set Transplanting Implements.—F. Richards, Freeport, N. Y.

One package Cassa Banana Seeds.—J. L. Normand, Marchville, La.

One package Cions, eleven varieties.—C. Howard Shinn, Berkeley, Cal.

The following newspapers and other publications are kindly donated to the Station by the publishers:

Agricultural Epitomist, Indianapolis, Ind.; weekly. American Agriculturist, New York City; weekly. American Creamery, New York City; weekly. American Cultivator, Boston, Mass.; weekly. American Dairyman, New York City; weekly. American Fertilizer, Philadelphia, Pa.; monthly. American Grange Bulletin, Cincinnati, Ohio; weekly. Baltimore Weekly Sun, Baltimore, Md.; weekly. Cultivator & Country Gentleman, Albany, N. Y.; weekly. Dairy World, Chicago, Ill.; weekly. Detroit Free Press, Detroit, Mich.; bi-weekly. Elgin Dairy Report, Elgin, Ill.; weekly. Farming, Toronto, Ont.; monthly. Farmer's Advocate, Burlington, Vt.; weekly. Farmer's Advocate, London, Ont.; weekly. Farmer's Guide, Huntington, Ind.; weekly. Farmer's Home, Dayton, Ohio; weekly. Farmer's Journal, Philadelphia, Pa.; weekly. Farmer's Magazine, Springfield, Ill.; weekly. Farmer's Review, Chicago, Ill.; weekly. Farmer's Voice, Chicago, Ill.; weekly. The Florist's Exchange, New York City; weekly. The Forester, Princeton, N. J.; weekly. Fruit, Dunkirk, N. J.; weekly. Grange Visitor, Charlotte, Mich.; weekly. Green's Fruit Grower, Rochester, N. Y.; weekly. Hoard's Dairyman, Ft. Atkinson, Wis.; weekly. Holstein Fresian Register, Brattleboro, Vt.; monthly. The Homestead, Des Moines, Iowa; weekly. Horticulture, Cuyahoga Falls, Ohio; monthly. Horticultural Visitor, Kinmundy, Ill.; monthly. Industrial American, Lexington, Ky.; monthly. The Irrigation Age, Chicago, Ill.; monthly. The Jersey Bulletin, Indianapolis, Ind.; monthly. The Louisiana Planter, New Orleans, La.; monthly. Maine Farmer, Augusta, Me.; weekly. The Market Garden, Minneapolis, Minn.; weekly. Massachusetts Ploughman, Boston, Mass.; weekly. Mirror & Farmer, Manchester, N. H.; weekly. Montana Fruit Grower, Missoula, Mont. New England Farmer, Boston, Mass.; weekly. New England Florist, Boston, Mass.; weekly. New England Homestead, Springfield, Mass.; weekly. New York Farmer, Port Jervis, N. Y.; weekly. New York Produce Review, New York City; weekly. Northern Leader, Fort Fairfield, Me.; weekly. Ohio Farmer, Cleveland, Ohio; weekly. Ohio Valley Farmer, Cincinnati, Ohio; weekly. Orange County Farmer, Port Jervis, N. Y.; weekly. Oregon Agriculturist, Portland, Oregon; bi-weekly. Pacific Coast Dairyman, Tacoma, Wash.; weekly. Practical Farmer, Philadelphia, Pa.; weekly. Public Ledger, Philadelphia, Pa.; daily. Rural Californian, Los Angeles, Cal.; monthly. Rural Canadian, Toronto, Ont.; weekly. Rural New Yorker, New York City; weekly. Southern Cultivator, Atlanta, Ga.; weekly. Southern Farmer, New Orleans, La.; weekly. Southern Planter, Richmond, Va.; weekly. Southern States, Baltimore, Md.; monthly. Southwestern Farmer, Wicheta, Kans.; weekly. Success with the Garden, Rose Hill, N. Y.; monthly. Turf, Farm and Home, Waterville, Me.; weekly. Vick's Magazine, Rochester, N. Y.; monthly. Wallace's Farmer, Des Moines, Iowa; weekly. Weekly Call, San Francisco, Cal.; weekly. Western Agriculturist, Chicago, Ill.; weekly.

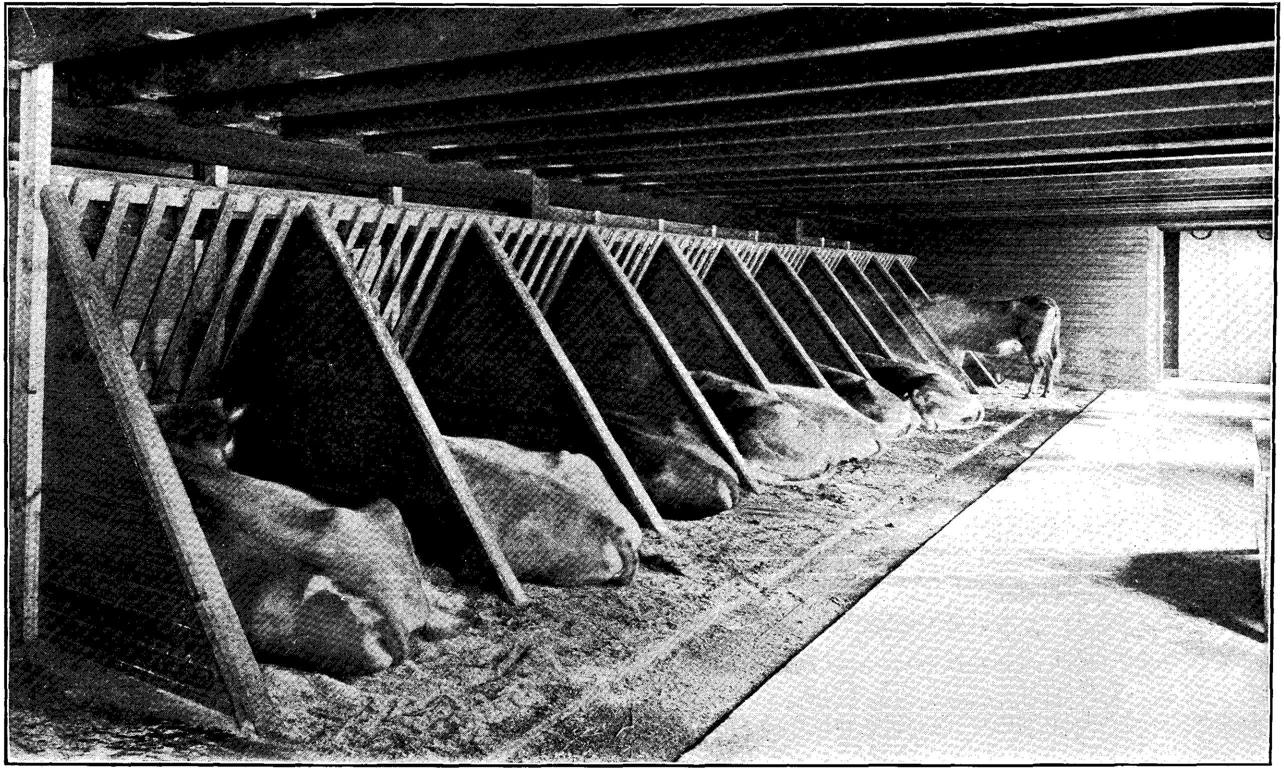
NEW FITTINGS OF THE COW STABLE.

G. M. Gowell.

In the construction of the first cattle barn at the college, separate mangers were provided for each animal, but all stood upon one common platform which was raised four inches above the bottom of the manure trench. The cattle were fastened around the necks with common tie-chains. In fifty feet of the tie-up this platform was four feet and four inches wide, and in the other fifty feet, it was four feet and ten inches wide, the better to accommodate long and short cows.

The difficulty of keeping the animals clean caused us to raise the platform to ten inches above the trench. No other changes were made. With the low platform, one hour had been required for the man to card, brush and properly clean the twenty-nine cows. After the platform was raised it required sixteen minutes of the same man's time to keep them as clean as before. This record extended over several days, and represented fairly the time required with each floor. The advantage with the high platform was, that the cattle would not back down into the trench very frequently and track their voidings up on to the platform to soil themselves when they lay down, as they did when the low platform was used.

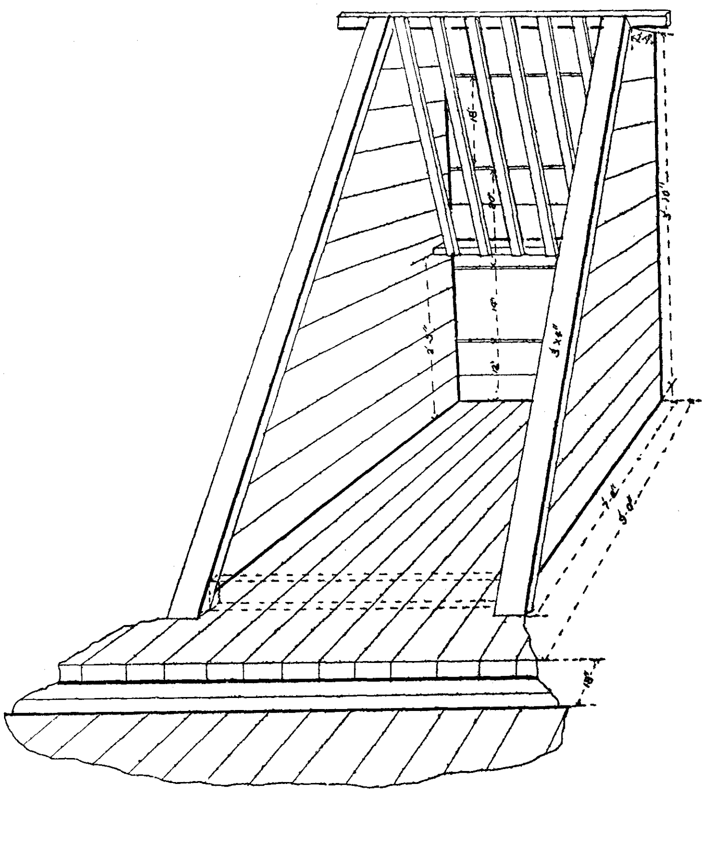
This high platform was not dangerous, causing animals to slip or fall, as is shown by our twelve years experience with it. We never had a case of lameness resulting from its use, and never a case of abortion in our herds, which, had it occurred, might perhaps have been ascribed to this as its cause. We encountered one difficulty in its use. When a cow lay down, the one standing next to her would sometimes step on her teats and bruise or cut them. This was not of frequent occurrence, but yet sufficiently so as to cause considerable trouble and anxiety. If we constructed partitions between the animals to prevent this difficulty they would be compelled to back out of their stalls down over the ten-inch drop into the trench, when we turned them out. This was not convenient for them to do. They had



TIE-UP IN LOWER BARN.

ordinarily turned on the high platform and walked off from it with ease; the partitions would prevent their doing so.

In reconstructing this barn last fall we attempted to secure some plan of stalls that would give the advantages of the one we already had and would at the same time be free from its objectionable features. It was decided to adopt the leading features of the "Hoard Stalls" and make such changes as seemed advisable to adapt it to our wants. The accompanying cut shows the plan and details of construction. The sleepers under the floor have no incline. The floor upon which the cows are placed is nine feet wide and has an incline of two inches in the nine feet. This incline is secured by laying pieces of tapering furring that are nine feet long, and are three inches thick at one end, and one inch thick at the other end, upon the sleepers, and laying the flooring upon them, using one thickness of plank or two thicknesses of boards.



At the side of the platform is the manure trench which is eighteen inches wide. The floor of this trench is made of one thickness of two inch plank laid directly on the floor sleepers. Narrow strips of one inch boards, for furring, are laid on the sleepers, from the manure trench to the outside sill of the barn, and are floored over with two inch plank, covered with one inch boards, breaking joints. When completed this leaves the trench two inches deep. Our stalls vary from three feet and four inches, to four feet in width; the wide ones being reserved for some of the larger animals. Three feet and six inches is about the right average width.

A convenient course to pursue in constructing the stalls is, first, to set the three by four inch studs at the corners of the stalls next to the feed floor of the barn, and then to put in place the eight inch plank which is the bottom of the feed rack and extends from post to post. The bottom of this plank should be twenty-nine inches from the floor, and its back edge should be beveled to take the narrow strips of the feed rack which are nailed to it. The top or head rail, which is two by four inches, is set at an angle, the upper corner being five feet and ten inches from the floor and twenty-eight inches from the front end of the stalls.

The partitions are a single thickness of one inch boards nailed to the three by four studs at the front end of the stalls, and extending back; the ends being cut on an angle to fit into the groove in the inclining three by four header which is nailed to the head rail at one end and the floor at the other end.

This header piece has its corners chamfered and the one inch deep groove is in the four inch side. The manger strips are one by two inches in size, and are placed four inches apart. The head rail is held in place by strips nailed to it and the front studs.

The top floor of the stalls is put down last and is of one inch boards running up and down the stalls. Pieces of three by four joist are placed on edge across the stalls near the ends of the partition and fastened to the floor by two large wire nails. The upper corners of these pieces are chamfered. They are to be put just in front of, and close to the hind feet of the animal when it stands up in the stall with its head close to the slats of the feed rack.

The lower door in front, through which grain and silage are fed is fourteen inches wide, and its lower edge is twelve inches from the floor. The upper door through which the hay is fed is eighteen inches wide and the space between it and the lower door is twenty inches. The doors are hinged at the upper edges and shut down, to avoid the crowding at the hinges, caused by chaff, etc., when hung to shut up. The animals are fastened by leather head halters, the ropes of which are two and one-half feet long, to the ring placed in the edge of the bottom of the feed rack.

The floor in the front part of the stall is swept clean before feeding the grain and silage, which are put directly on the floor. The animal steps forward putting its hind feet in front of the cross piece and eats the grain or silage and then, lifting its head is forced to step back over the cross piece in order to stand comfortably. The animal rarely voids while standing forward eating from the floor, but does so while standing back. When they are first put into the stalls they will sometimes lie down on the cross pieces but they get up very quickly and seek more comfortable positions by stepping in front of the bar and lying there, where there is plenty of room and comfort.

After the cows had been in their quarters about a month and had become accustomed to lying forward in the stalls, the cross pieces were removed. This was done several weeks ago, yet they have all continued to step forward when about to lie down, precisely as they did when the cross pieces were in place. How long they will continue to do so without the cross pieces to prompt them remains to be seen. The only objection to the cross pieces is that they are somewhat in the way of the milkers until they become accustomed to them. When leaving their stalls animals back out into or across the two inch deep manure trench without hesitation.

Our experience, thus far, with these stalls is very satisfactory. The animals have much freedom, as they step back and forth the length of their halters, and are able to reach back and lap themselves much to their satisfaction. They require but little carding and brushing to keep them clean, and while lying down they are safe from the injuries liable to be inflicted by their over-crowding mates.

The material used in the construction of these stalls was native spruce, planed on all sides. The cost of furnishing a barn with these stalls is less than that of stancheons, or mangers and chains. They are so sensible, simple and cheap, that they commend themselves to every cattle owner, whether he has an old fashioned barn or is constructing a new one.

A generous supply of windows is provided for the admission of light and sunshine. Outside windows are used during the coldest weather and are essential to prevent freezing in the tie-up, as it is kept open in front into the drive or feed floor except in the severest weather. This part of the barn furnishes plenty of fresh air to the animals, as it opens directly into the large ventilators on the ridge of the barn which are never closed. When it becomes necessary for the comfort of the animals, to close the shutters in front of them, the tie-up in which they are confined is completely ventilated by the ventilating shutes that are twelve by twenty-four inches, inside measurement, and extend from the tie-up, up the walls and roof to the ventilators at the ridge. These shutes are as near air tight as they can be made with matched boards and building paper, and have an upright height of forty-five feet.

It is essential that the ventilators be tight, as every little crack acts as a damper and checks the draft. It is necessary that the shutes be of large size, and as high as possible so as to displace large quantities of foul air. One of these shutes to each fifty feet in length of the tie-up, ventilates so completely that the air seems fresh and dry in the morning, after the room has been closed during the night. The cellar is ventilated by four shutes of similar size, but greater length, arranged in the same way.

For watering, two troughs are placed, in the one hundred feet long tie-up, next the wall, behind the cattle. A rope about two feet long is fastened near the ends of each trough. These ropes, and the ones in the stalls, have snaps at their ends, and the cattle are quickly unfastened and led to the trough and secured. Four animals are in process of watering at the same time. They cannot wander about, and the ropes are so short that they cannot play with each other and waste the time of the herdsman. After using individual watering buckets or fountains, of a good pattern, for two years, we have discarded them for the reasons that they get foul quickly and require much cleaning. They have valuable features and we gave them up with reluctance. Our troughs are emptied and cleaned twice every day and filled with fresh water.

The bull pens are on the opposite side of the barn from the tie-up. They are nine by sixteen feet in size and have substantial walls. For fastening the animal a steel rod ten feet long and one and one-fourth inches in diameter, is placed horizontally along one of the long sides of the pen, thirty inches from the floor and two inches from the wall. It is held in position by a strong bolt at each end, and held away from the wall by thick washers. A strong sliding ring with swivel is placed on the rod, and the bull is fastened to it with chain or halter. He is at liberty to get considerable exercise by walking back and forth the length of the rod and yet he is securely fastened. This arrangement saves the time of the attendant required in exercising the mature animal that is unsafe if turned loose in the yards, and it gives the creature a chance for voluntary exercise at all times.

ANALYSES OF FODDERS AND FEEDING STUFFS.

In connection with the work of the Station, analyses of the following miscellaneous feeding stuffs have been made by the Station chemists. For the most part the analyses were made in connection with the feeding experiments or experiments upon the growth of plants. In no case were they undertaken merely to increase the amount of this class of data. The methods of analyses recommended by the Association of Official Agricultural Chemists were employed.

The results of the analyses are given in the tables which follow:

COMPOSITION OF FODDERS AND FEEDING STUFFS ANALYZED IN 1896, CALCULATED TO WATER CONTENT AT TIME OF TAKING SAMPLE.

	Laboratory number.	Water.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat
		%	%	%	%	%	%
Sunflower heads	4004	86.07	1.10	1.93	3.79	5.62	1.49
Sunflower, whole plant	4005	85.21	1.92	1.70	4.00	6.14	1.03
English horse beans	4006	82.65	2.09	3.88	3.71	7.18	0.49
Silage—mature corn, sunflower heads, horse beans	599	70.33	1.73	3.44	6.33	16.44	1.73
Silage—mature corn, sunflower heads, horse beans	600	69.61	1.74	3.80	6.43	16.25	2.17
Silage—mature corn, sunflower heads, horse beans	601	69.89	1.58	4.25	5.79	16.80	1.69
Silage—mature corn, sunflower heads, horse beans	602	68.95	1.43	4.38	5.96	17.34	1.94
Maine Field Corn, planted at 6 inches	4001	80.64	1.18	1.91	3.76	11.90	0.60
Maine Field Corn, planted at 9 inches	4002	80.68	1.14	1.85	4.21	11.62	0.50
Maine Field Corn, planted at 12 inches	4003	79.26	1.25	2.21	4.09	12.60	0.59
King Gluten Meal	613	8.80	1.54	33.13	1.35	39.40	15.78
Potato Pomace	614	10.96	2.71	6.56	10.26	68.99	0.52
Juncus Gerardi	594	7.99	5.50	7.56	26.37	48.46	4.12

COMPOSITION OF WATER FREE SUBSTANCE OF FODDERS AND FEEDING STUFFS ANALYZED IN 1897.

	Laboratory number.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
		%	%	%	%	%
Sunflower heads	4004	7.89	13.87	27.20	40.33	10.70
Sunflower, whole plant.	4005	13.04	11.55	27.04	41.60	6.78
English horse beans	4006	12.07	22.34	21.41	41.35	2.82
Silage—mature corn, sunflower heads, horse beans	599	5.83	11.60	21.35	55.38	5.84
Silage—mature corn, sunflower heads, horse beans	600	5.75	12.50	21.15	53.50	7.10
Silage—mature corn, sunflower heads, horse beans	601	5.22	14.10	19.25	55.82	5.61
Silage—mature corn, sunflower heads, horse beans	602	4.60	14.10	19.20	55.86	6.24
Maine Field Corn planted at 6 inches	4001	6.10	9.88	19.40	61.49	3.10
Maine Field Corn planted at 9 inches	4002	5.88	9.58	21.79	60.16	2.59
Maine Field Corn planted at 12 inches	4003	6.04	10.68	19.70	60,74	2.86
King Gluten Meal	613	1.69	36.35	1.48	43.18	17.30
Potato Pomace	614	3.02	7.36	11.52	77.58	0.52
Juncus Gerardi	594	5.98	8.22	28.70	52.62	4.48

PROFITABLE AMOUNT OF SEED PER ACRE FOR CORN.

J. M. BARTLETT.

This experiment was planned by Prof. Jordan and is a repetition of those made for the same purpose in 1894 and 1895.* An acre of land was used this season as before, and for a dressing it received fifteen two horse loads of stable manure, 250 pounds acid South Carolina Rock, 100 pounds nitrate of soda and 75 pounds muriate of potash.

The acre was divided into twelve plots, or four sets of plots with three plots in a set. The corn was planted May 19. On one plot in each set the single kernels were planted six inches apart, on another nine inches, and on the third twelve inches. This gave four plots or one-third of an acre planted by each method.

Great pains were taken to insure a stand of stalks in accordance with the plan, and the experiment appeared to be a success so far as the field work was concerned. The growth of the corn was all that could be desired and the crop produced was greater than ever before secured here by this method of planting. September 8-10, it was harvested and put in the silo, the kernels being well glazed and in the best condition for silage.

Below is given the composition of the 1896 crop and the ratio of yield for all three years.

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* Reports of this Station for 1894 p. 33 and 1895 p. 19.

COMPOSITION OF WATER FREE SUBSTANCE OF CORN (WHOLE PLANT) FROM VARYING QUANTITIES OF SEED.

Distance Planted.	Laboratory number.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
		%	%	%	%	%
Kernels 6 inches apart	4001	6.10	9 87	19.42	61.47	3.10
Kernels 9 inches apart	4002	5.90	9.57	21.79	60.15	2.59
Kernels 12 inches apart	4003	6.03	10.66	19.72	60.75	2.84

YIELD PER ACRE OF CORN (WHOLE PLANT) FROM VARYING QUANTITIES OF SEED.

Distance Planted.	Crop of 1894.			Crop of 1895.			Crop of 1896.		
	Total yield.	Dry matter.	Yield dry matter.	Total yield.	Dry matter.	Yield dry matter.	Total yield.	Dry matter.	Yield dry matter.
	Lbs.	%	Lbs.	Lbs.	%	Lbs.	Lbs.	%	Lbs.
6 inches apart	21,315	21.1	4,497	16,020	37.42	5,995	34,110	19.36	6,604
9 inches apart	22,530	20.9	4,709	15,780	38.47	6,071	34,680	19.32	6,700
12 inches apart	20,190	20.5	4,139	15,675	35.45	5,558	31,815	20.74	6,598

The results so far reached indicate that the amount of seed may vary greatly without materially affecting the yield of dry matter in the mature crop. The average yield per acre of dry matter for the three seasons with the several rates of seeding are as follows: Kernels six inches apart 5,699 pounds; at nine inches 5,827 pounds; at twelve inches 5,432 pounds.

There appears so far to be only a small difference between six inches and nine inches seeding, whereas the yield from the twelve is considerably less.

SUNFLOWERS AND ENGLISH HORSE BEANS AS SILAGE CROPS.

J. M. Bartlett.

For three seasons sunflowers have been grown on a small scale for a silage crop. In 1894 and 1895 very fair yields were secured but the season of 1896 was very favorable and an exceedingly heavy crop was the result.

Horse beans have been grown for two seasons, but owing to late planting and drought the crop of 1895 was not up to the average yield. In 1896 the seed was planted early for this climate, May 18th. The plants grew well, attaining a height of 3 to 4 feet, and contained many matured pods when harvested. A good yield was secured but it is possible that it could have been made somewhat larger, without impairing the quality, by planting somewhat closer. The plants stood about one foot apart in drills three to three and one-half feet apart.

Both crops were harvested September 8-10, run through the silage cutter and mixed with corn in the silo, in the following proportions: one-fourth acre of sunflowers, one-half acre of horse beans, and one acre of corn. The whole plant of one-half of the sunflowers was put in the silo mixed with corn and beans. Of the remaining half the heads only were used.

Both mixtures were found to be well preserved when the silo was opened in January, and were greedily eaten by the cows. The stalks of the sunflowers were so large and coarse that it seemed doubtful whether the cattle would eat them, but after being ensiled the mixture was as well relished as the pure corn. The cost of growing these crops can be estimated to be about the same as that of corn. The land should be put in about the same condition and the labor of caring for them is not materially different.

YIELD PER ACRE IN POUNDS.

Names of Plants.	Weight as harvested.	Weight of dry matter.
Sunflower, heads	27,040	3,767
Sunflower, whole plant	48,800	7,219
English horse bean, whole plant	20,160	3,497

CHEMICAL COMPOSITION OF THE PLANTS.

	Fresh Material as Harvested.						Dry Material (Water Free).				
	Water.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Ether extract.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Ether extract.
	%	%	%	%	%	%	%	%	%	%	%
Sunflower, heads	86.07	1.10	1.93	3.79	5.62	1.49	7.89	13.87	27.20	40.33	10.70
Sunflower (whole plant)	85.21	1.92	1.70	4.00	6.14	1.03	13.04	11.55	27.04	41.60	6.78
Horse bean (whole plant)	82.65	2.09	3.88	3.71	7.18	0.49	12.07	22.34	21.41	41.35	2.82

The very large yield of sunflowers (whole plant) per acre shown in the table above would apparently secure for them a favorable position among coarse fodder plants for silage material.

The yield of dry matter is slightly larger than has ever been obtained at the Station from corn, but notwithstanding that fact it cannot be considered as desirable a plant to raise for fodder where corn can be grown successfully. Its chemical composition is about the same as that of southern corn grown in this climate; the exceedingly coarse, rough stalks and leaves of the plant make it less palatable as a fodder and were it not ensiled would be largely rejected by stock.

The chief value, therefore, of the experiment with this plant consists in showing the utility of the silo in saving such materials and preventing waste. Sunflowers and other coarse plants are often grown for seed or other purposes when only a small portion of the plant is used. The coarse parts that were formerly thrown away can be now utilized and made into palatable and nutritious food for stock by ensiling.

Horse beans are rich in protein and promise to rank well with plants of that class as forage crops. They have the ability, like most legumes, to gather nitrogen from the air, and consequently do not exhaust the soil of that element. At the present time, however, when the price of nitrogenous feeds, like gluten meal and cotton seed meal, is so low, it is a question whether it is not more profitable for a farmer to give his attention largely to growing corn for coarse fodders and buy nitrogenous feeds to balance up the ration.

TESTS OF SEPARATORS.

J. M. Bartlett.

These tests were not undertaken with the idea of making an extensive investigation of separators, but to compare, principally for our own satisfaction, the three hand machines that are now in the dairy building; two of which, the Empire and United States, have been placed there free of cost for use in the dairy school. The DeLaval Company also supplied us with one of the Humming Bird machines for that purpose.

The machines used, sizes and capacities are shown in the table. The operator could detect no material difference in the ease of running of the United States No. 5 or Baby No. 2. The Empire being a larger machine of course ran harder. He, however, preferred the United States to the others on account of the simplicity of the bowl, it requiring less time to set it up, clean, etc.

If in handling the DeLaval discs they are arranged on a wire, the difference in time and work required to clean and set them up more than that required for one of the simpler bowls, is not so much as one would think.

In the first tests that were made the bowl washings were tested, to estimate losses in that direction, but as the amount of loss was about the same for each machine and the percentage was proportional to the amount of milk run through, this factor was disregarded in the experiment.

The determination of fat in the skimmed milk was made in most cases both by the gravimetric and the Babcock volumetric methods.

The Babcock method, the writer finds, is not reliable when the fat runs below .05 or .06 per cent, even when the B. & W. skimmed milk bottle is used. In several cases, not given in the table, where the Babcock method showed no fat or only a trace, the gravimetric showed .06 to .08 per cent. There are a great many chances for such small amounts of fat as are found in separator skimmed milk to become lost by sticking to the sides of the bottle when all conditions are not exactly right, and after it once adheres the centrifugal force used will not remove it. The results of the tests are here given in tabular form.

TESTS OF SEPARATORS.

KIND OF SEPARATOR.	Capacity of machine.	Time required for 100 pounds milk.	Revolutions of handle per minute.	Temperature of milk.	Fat in cream.	Fat in skimmed milk gravimetric method.	Fat in skimmed milk Babcock method.
U. S. Separator No. 5....	270 to 350	18 m.	45 to 48	85° F.	28.0	.04	.05
U. S. Separator No. 5 ...	270 to 350	19 m.	45 to 48	85° F.	29.0	.06	.04
U. S. Separator No. 5 ...	270 to 350	17 m.	45 to 48	85° F.	34.0	.12	.10
U. S. Separator No. 5....	270 to 350	17 m.	45 to 48	85° F.	35.0	.14	.12
De Laval Baby No. 2....	325 to 350	22 m.	40 to 42	85° F.	30.0	....	.06
De Laval Baby No. 2....	325 to 350	21 m.	40 to 42	85° F.	30.0	.06	.07
De Laval Baby No. 2....	325 to 350	20 m.	40 to 42	85° F.	33.0	.10	.09
De Laval Baby No. 2....	325 to 350	19 m.	40 to 42	85° F.	33.0	.09	.10
Empire No. 5	400	14 m.	45 to 48	85° F.	26.0	....	.05
Empire No. 5	400	13 m.	45 to 48	85° F.	28.4	....	.04
Empire No. 5	400	13 m.	45 to 48	85° F.	34.0	.11	.04

FEEDING EXPERIMENTS WITH MILCH COWS.

J. M. BARTLETT.

(1) Gluten meal compared with cotton-seed meal for milch cows.

(2) Silage compared with grain as food for milch cows.

(3) Ground oats compared with wheat bran for milch cows.

(4) Nutriotone for the production of milk.

Feeding experiments with milch cows under ordinary conditions are somewhat unsatisfactory. There are many factors, beyond the experimenter's control, which come in to cause greater variations in milk yield than would be produced by any change in the ration one would care to make use of in rational feeding. Conclusive results are, therefore, not to be expected from single, brief feeding trials. It is only from the accumulated data of a large number of such trials that results of a reliable nature are obtained. Of course a very wide ration like that of timothy hay and corn meal will show its inferiority in a single feeding experiment, but the intelligent dairy farmer of today is already aware of that fact, and such irrational feeding experiments are no longer necessary. Considering the question as to whether a ration with a nutritive ratio of 1 to 4 or 1 to 6 is the more profitable, there are very little reliable data on which to base conclusions. Some of the most intelligent dairy farmers claim the best results from the very narrow ration of 1 to 4, while others are equally confident that the wider one of 1 to 6 is the better. It is in studying such problems as this in which results are not decisive that the single experiment is the most unsatisfactory, and it is only from the results of a large number of trials that definite information is obtained. The individuality of cows is a perplexing element in a feeding experiment. Cows are somewhat like people, and a ration that agrees best with one does not always agree with another.

Climatic conditions as heat and cold have a marked effect on some animals. A sudden drop in the temperature will sometimes cause a cow to shrink enough in milk flow to obliterate any difference in yield that might be produced by the food she is eating. Anything that causes nervous excitement may cause a temporary shrinkage in milk flow. A change of milkers, which one is sometimes obliged to make during an experiment, may cause difference enough in the milk yield to spoil the experiment. To eliminate some of these sources of error, the experimenter employs as many animals as practicable and takes careful note of all the conditions under which the experiment is made.

For the experiments which are given in the following pages, six registered Maine State Jerseys, known by the numbers 1, 2, 3, 4, 5 and 6, were used. Their ages ranged from 5 to 8 years, except Nos. 5 and 6, which were 3 and 4 years old respectively. All were fresh in milk and in good condition. Their milk flow was not quite up to their average for the reason that they were recently purchased, and transportation caused a shrinkage from which they did not recover.

In the experiments conducted with these animals they were divided into two groups or lots of three each, making it possible to feed the two rations to be compared through each period, thereby avoiding, to some extent, the errors caused by changes in temperature, advance in the period of lactation, etc.

In calculating the digestible nutrients in the foods used, the American coefficients were employed, except for corn meal, for which the German coefficients were used.

DIGESTION COEFFICENTS USED.

	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Hay	49	53	63	57
Silage	65	76	73	70
Corn meal	76	....	92	92
Gluten meal	87	....	91	88
Cotton-seed meal	88	....	64	97
Bran	78	25	68	72

GLUTEN MEAL COMPARED WITH COTTON-SEED MEAL AS FOOD FOR MILCH COWS.

The object of this experiment, the results of which are given in the following tables, was to compare the feeding value of gluten meal with cotton-seed meal, when fed in such proportions that the quantity of digestible nutrients of the one equalled those of the other.

Gluten meal, a material made from the residue left in the manufacture of starch and glucose from Indian corn or maize, is now offered quite extensively in our markets as a cattle food. There are also several other products made from this residue which are known by various names, such as gluten feed, corn bran, corn germ, etc. None of these, however, are so rich in protein as gluten meal, for the reason that in its manufacture the hull and germ of the kernel is removed, which is not the case in the manufacture of the other materials mentioned. The high grade meals do not differ greatly in composition from linseed meal and average about one-quarter less protein than cotton-seed meal. They also contain but little ash, and are less valuable than the oil meals as manure formers.

In this, as in all the other experiments, the animals were kept in as nearly uniform conditions as possible, and the grain ration fed was small so as to avoid an excess of nutrients in either ration. The cows were weighed at the beginning and close of each period, so that any gain or loss in flesh could be noted, and the milk was accurately weighed at each milking. Samples were taken the last five days of each period, and the average of the results obtained was taken as the average composition of the milk for that period. The butter made from the milk produced, while the cows were on each ration, was tested for quality and hardness.

WEIGHT OF COWS AT THE BEGINNING OF THE EXPERIMENT.

Cow's number	1	2	3	4	5	6
Weight in pounds	790	905	963	990	785	863

RATIONS FED DAILY.

Ration I.
Timothy hay, 15 lbs.; silage, 20 lbs.; mixed grain, 8 lbs. { Gluten meal, 3 lbs. Corn meal, 2 lbs. Bran, 3 lbs.

Ration II.
Timothy hay, 15 lbs.; silage, 20 lbs.; mixed grain, 8 lbs. { Cotton-seed meal, 2 lbs. Corn meal, 2½ lbs. Bran, 3 lbs.

Cows Nos. 5 and 6 received but 6 and 7 pounds of grain respectively. The others received the full ration as given above.

COMPOSITION OF FOODS USED.

KINDS OF FOOD.	Water.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
	%	%	%	%	%	%
Hay	13.2	4.4	5.9	29.0	45.0	2.5
Silage	69.9	1.6	4.0	6.0	16.6	1.9
Corn meal	14.4	1.4	9.3	1.9	69.2	3.8
Gluten meal	9.1	0.9	33.7	1.3	49.5	5.5
Cotton-seed meal	8.0	7.2	42.4	5.6	24.2	12.6
Bran	11.7	5.9	15.4	8.9	54.0	4.1

DIGESTIBLE NUTRIENTS CONSUMED BY EACH LOT OF COWS PER DAY.

KIND OF NUTRIENTS.	RATION I WITH GLUTEN MEAL.				RATION II WITH COTTON-SEED MEAL.			
	Period I. Lot I.	Period II. Lot II.	Period III. Lot I.	Average during tests.	Period I. Lot II.	Period II. Lot I.	Period III. Lot II.	Average during tests.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Protein	7.0	6.5	7.0	6.8	6.2	6.7	6.2	6.4
Carbohydrates	40.6	39.2	40.6	40.1	37.2	38.3	37.2	37.6
Fats	2.4	2.2	2.4	2.3	2.6	2.7	2.6	2.6

TEMPERATURE OF STABLE AND YIELD OF MILK FOR EACH COW PER WEEK.

PERIODS.*	Temperature of stable.	YIELD OF MILK PER COW.							
		Cow No. 1.	Cow No. 2.	Cow No. 3.	Total Cows 1—3.	Cow No. 4.	Cow No. 5.	Cow No. 6.	Total Cows 4—6.
	Deg.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
I. Dec. 3 to Dec. 21.									
First week	44	92.4	138.3	141.5	372.2	134.5	147.0	131.3	412.8
Second week.......	38	91.9	147.8	144.3	384.0	130.8	155.3	137.1	423.2
Third week	49	96.4	148.5	149.6	394.5	130.2	154.7	135.1	420.0
II. Dec. 22 to Jan. 11.									
First week	51	93.3	139.6	141.8	374.7	136.6	160.8	138.3	435.7
Second week..	49	93.4	136.6	140.9	370.9	130.0	162.5	135.6	428.1
Third week	35	92.0	132.4	133.9	358.3	127.6	158.6	134.6	420.8
III. Jan. 12 to Feb. 1.									
First week	43	99.1	143.3	137.5	379.9	129.0	155.5	136.7	421.2
Second week............. ...	42	92.4	135.6	131.9	359.9	125.9	150.6	128.0	404.5
Third week	41	91.0	130.8	125.0	346.8	121.1	150.0	123.6	394.7

* In periods I and III cows 1, 2 and 3 received the ration containing gluten meal, and cows 4, 5 and 6, that containing cotton-seed meal. In Period II the rations were reversed.

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WEIGHT GAINED OR LOST, MILK, SOLIDS AND FAT PRODUCED BY EACH COW FOR EACH PERIOD.

	Period.	Cow's number.	Weight gained.	Weight lost.	Milk.	Solids.	Fat.
RATION I.			Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Gluten meal was fed.	I	1	......	25	280.6	40.3	14.1
	I	2	21	......	434.5	60.7	21.7
	I	3	......	8	435.4	63.3	22.5
	II	4	45	......	394.2	58.2	19.2
	II	5	......	10	481.9	68.7	22.1
	II	6	3	......	408.5	62.2	33.1
	III	1	5	......	282.5	40.2	14.0
	III	2	1	......	409.6	57.5	18.4
	III	3	2	......	394.4	56.5	20.2
RATION II.	I	4	35	......	395.5	58.9	20.1
	I	5	......	......	456.9	62.9	21.2
Cotton seed meal was fed.	I	6	9	......	403.5	60.8	22.6
	II	1	35	......	278.6	41.7	14.7
	II	2	16	......	408.6	57.1	20.9
	II	3	11	......	416.5	60.0	22.0
	III	4	......	8	376.0	55.6	18.5
	III	5	10	......	456.1	64.0	20.3
	III	6	15	......	388.4	59.7	22.5

TOTAL AND DAILY YIELD OF MILK, SOLIDS AND FAT FOR EACH LOT FOR EACH PERIOD.

RATION.	Period.	Weight gained.	Weight lost.	Milk.	Solids.	Fat.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
I. Gluten meal, Lot I	I	......	12	1150.5	164.3	58.3
Average daily yield	......	......	......	18.3	2.6	0.92
I. Gluten meal, Lot II	II	38	......	1284.6	189.1	64.4
Average daily yield	......	......	......	20.4	3.0	1.02
I. Gluten meal, Lot I	III	8	......	1086.5	154.2	52.6
Average daily yield	......	......	......	17.2	2.4	0.82
II. Cotton seed meal, Lot II	I	44	......	1255.9	182.5	63.8
Average daily yield	......	......	......	19.9	2.9	1.01
II. Cotton seed meal, Lot II	II	62	......	1103.7	158.7	57.5
Average daily yield	......	......	......	17.5	2.5	0.91
II. Cotton seed meal, Lot II	III	17	......	1220.5	179.2	61.3
Average daily yield	......	......	......	19.4	2.8	0.97
I. Average daily yield gluten meal	......	......	......	18.6	......	0.92
II. Average daily yield cotton seed meal	......	......	......	18.9	......	0.96

DIGESTIBLE NUTRIENTS EATEN FOR EVERY POUND OF MILK, SOLIDS, AND FAT PRODUCED.

	Ration I with Gluten Meal.								Ration II with Cotton-Seed Meal.							
	Period I. Lot I.		Period II. Lot II.		Period III. Lot I.		Average during tests.		Period I. Lot II.		Period II. Lot I.		Period III. Lot II.		Average during tests.	
	Protein.	Carbohydrates.	Protein.	Carbohydrates.	Protein.	Carbohydrates.	Protein.	Carbohydrates.	Protein.	Carbohydrates.	Protein.	Carbohydrates.	Protein.	Carbohydrates.	Protein.	Carbohydrates.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Milk....	.12	.83	.11	.72	.13	.89	.12	.81	.10	.71	.13	.84	.11	.74	.11	.76
Solids ..	.89	5.86	.72	4.91	.95	6.24	.85	5.67	.71	4.09	.89	5.88	.73	5.03	.78	5.00
Fat	2.53	16.53	2.12	14.44	2.79	18.24	2.48	16.40	2.05	14.17	2.45	16.21	2.13	14.71	2.21	15.03

SUMMARY.

The foregoing data indicate that gluten meal is fully equal to cotton-seed meal when fed in sufficient quantity to make the amount of digestible nutrients equal in each ration.

It is not equal to cotton-seed meal pound for pound as a source of protein, as it contains, on an average, about one quarter less of that nutrient.

It makes a very good quality of butter, but slightly softer than that made from cotton seed meal ration when fed in the quantity used in this experiment.

SILAGE COMPARED WITH GRAIN AS FOOD FOR MILCH COWS.

The object of this experiment was to again test the practicability of substituting silage, made according to Professor Robertson's formula, for a portion of the grain ration. The mixture was made as follows: One acre of matured field corn, one-half acre of horse beans, and one-quarter acre of sunflower heads, cut close, were run through the silage cutter and put in the silo. Owing to an unavoidable delay the corn was allowed to stand until too ripe and dry to make the best quality of silage.

The horse beans were rather immature, containing but few pods and were not at their best stage of growth for fodder. Owing to the dry condition of the corn, the silage did not keep well after the silo was opened and the time occupied by the experiment had to be cut down to two periods of two weeks each, which is shorter time than is desirable. With this exception the experiment may be considered a success. The silage was readily eaten and well relished by the cows. The gross amount of silage fed was not so large as in the experiment made in 1895 for the reason that the silage of 1896 contained considerable less water, but the total dry matter fed was about the same.

The ration fed for the first period was the same as fed in the third period of the experiment described above.

DAILY RATIONS FOR COWS.

Ration I. Timothy hay, 20 pounds; silage, 20 pounds; grain, 8 pounds.

Ration II. Timothy hay, 15 pounds; silage, 35 pounds; grain, 4 pounds.

Cows five and six received but six and seven pounds of grain respectively in the first period, and one-half that amount in the second period.

The results of the experiment are found in the following tables:

DIGESTIBLE NUTRIENTS CONSUMED BY EACH LOT OF COWS AND AVERAGE PER COW, PER DAY.

	Ration I.		Ration II.	
	Lot I.	Lot II.	Lot I.	Lot II.
	lbs.	lbs.	lbs.	lbs.
Protein	7.0	6.2	6.8	5.4
Carbohydrates	40.6	37.2	49.2	47.5
Fat	2.4	2.6	2.4	2.4
Total	50.0	46.0	57.4	55.3
Per cow	16.7	15.3	19.1	18.4

COMPOSITION OF MILK FOR LAST FIVE DAYS OF EACH PERIOD.

	Cow 1.		Cow 2.		Cow 3.		Cow 4.		Cow 5.		Cow 6.	
	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.
	%	%	%	%	%	%	%	%	%	%	%	%
January 28	14.41	4.80	13.93	4.80	14.24	4.95	14.75	4.80	14.47	4.55	15.28	5.80
January 29	13.62	4.90	13.87	5.20	14.17	5.30	14.64	5.10	13.35	4.50	14.97	5.55
January 30	13.94	4.80	14.56	4.95	14.46	5.20	14.88	4.80	13.74	4.20	15.7	6.00
January 31	14.64	5.30	14.14	4.80	14.45	5.05	14.81	4.85	14.20	4.50	15.62	6.00
February 1	14.52	5.05	13.77	5.00	14.30	5.10	14.86	5.00	14.21	4.55	15.31	5.65
Average	14.23	4.97	14.05	4.95	14.32	5.12	14.79	4.91	13.99	4.46	15.38	5.80
February 11	13.42	4.80	14.12	4.80	14.02	4.85	15.13	4.75	14.52	4.50	15.70	5.65
February 12	14.50	4.95	14.90	5.10	. ...	5.10	15.80	4.95	15.30	4.75	15.70	5.65
February 13	15.81	4.60	14.38	5.15	44.98	5.40	15.52	4.80	14.76	4.60	15.74	5.75
February 14	14.73	5.10	14.14	5.15	14.61	5.00	15.08	4.95	14.65	4.80	15.97	5.95
February 15	14.48	4.85	14.06	5.10	14.27	5.10	14.60	4.65	14.44	4.50	15.04	5.30
Average	14.59	4.86	14.32	5.06	14.47	5.09	15.23	4.82	14.73	4.63	15.63	5.66

TEMPERATURE OF STABLE AND YIELD OF MILK OF EACH COW PER WEEK.

	Temperature of stable.	1.	2.	3.	4.	5.	6.	Total.
Period I (Ration I).		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
January 19 to January 26	42	92.4	135.6	131.9	125.9	150.6	128.0	764.4
January 26 to February 1	41	91.0	130.8	125.0	121.1	151.0	123.6	741.5
Period II (Ration II).								
February 2—9	44	93.4	125.8	116.3	122.1	148.8	122.9	729.3
February 9—16	41	102.3	125.5	124.5	125.3	147.8	125.0	750.4

TOTAL YIELD OF MILK, SOLIDS AND FAT FOR EACH LOT OF COWS FOR EACH PERIOD.

	Period.	Weight gained.	Milk.	Solids.	Fat.
Ration I—full grain.	I.	lbs.	lbs.	lbs.	lbs.
Lot I		8			
Total yield			706.6	100.3	35.5
Daily yield per cow			16.8	2.4	.8
Lot II		17			
Total yield			800.3	117.4	40.2
Daily yield per cow			19.1	2.8	1.0
Ration II—one-half grain.	II.				
Lot I		70			
Total yield			687.6	99.4	34.5
Daily yield per cow			16.4	2.4	.8
Lot II		60			
Total yield			791.8	120.1	39.7
Daily yield per cow			18.9	2.9	.9

CONCLUSIONS DRAWN FROM THE FOREGOING DATA.

This experiment, although too limited to be of much value in itself, confirms the results of Professor Robertson's investigations and those obtained from experiments made at this Station last year, showing that silage, of the quality used, can be substituted in part for the grain ration of milch cows without causing loss of flesh or lessening the production of milk.

In this case fifteen pounds of silage appeared to equal four pounds of the grain mixture.

GROUND OATS COMPARED WITH WHEAT BRAN FOR MILCH COWS.

In some sections of the State oats are a very important crop and are extensively grown for market or feeding to animals. When the price is so low that it hardly pays to take them to market in exchange for other grains, the station receives frequent inquiries as to their value as feed for milch cows.

The grain is subject to quite wide variations in composition, depending somewhat on the variety, nature of the soil where grown, climatic conditions, etc. As a rule oats grown in high latitudes are heavier, contain less crude fiber and more nutrients than those grown farther south.

Good, heavy, northern grown oats do not vary greatly in composition from wheat bran, the principal difference being that they contain a little less protein, and ash materials. Their feeding value as far as has been determined is not materially different.

The average composition of northern grown oats and wheat bran is shown in the following table:

	Water.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
	%	%	%	%	%	%
Oats	10.00	3.0	12.50	9.00	60.50	5.00
Bran	12.00	6.0	15.50	9.00	53.50	4.00

The chemical composition, the digestibility of the two being about the same, would indicate that bran is worth slightly more pound for pound than oats, but so far as they have been tested practically, there does not seem to be any material difference. In the test made at this station, the results of which are given in the following tables, the six cows previously described were used. They were divided into two lots of three each. Lot I received ration I and lot II, ration II, for the first period. The order was reversed in the second period, lot I receiving ration II; lot II, ration I. In the third period both lots were fed as in the first period.

RATIONS FED DAILY.

Ration I—Hay, 20 pounds, mixed grain, 8 pounds. { Bran, 4 pounds. Corn meal, 2 pounds. Cotton seed meal, 2 pounds.

Ration II—Hay, 20 pounds, mixed grain, 8 pounds, { Ground oats, 4 pounds. Corn meal, 2 pounds. Cotton seed meal, 2 pounds.

Cows No. 2, 3 and 4 received the full rations as given above, but Nos. 1 and 6 received but seven pounds of grain mixture, and No. 5 but six pounds.

CHEMICAL COMPOSITION OF FOODS USED.

	Water.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
	%	%	%	%	%	%
Hay	13.2	4.4	5.9	29.0	45.1	2.5
Mixed grain (Ration I)	10.7	5.0	21.1	6.9	49.9	6.5
Mixed grain (Ration II)	10.8	3.8	19.0	8.1	51.8	6.5

TOTAL NUTRIENTS CONSUMED BY EACH LOT FOR EACH PERIOD.

Kinds of Nutrients.	Ration I with Bran.				Ration II with Oats.			
	Period I. Lot I.	Period II. Lot II.	Period III. Lot I.	Average during tests.	Period I. Lot II.	Period II. Lot I.	Period III. Lot II.	Average during tests.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs,	lbs.
Protein	175.6	166.8	175.6	172.7	157.7	165.7	157.7	160.4
Carbohydrates	1208.3	1184.5	1208.3	1200.4	1198.3	1218.4	1198.3	1205.0
Fats	62.3	59.6	62.3	61.4	59.8	62.5	59.8	60.7
Total	1446.2	1410.9	1446.2	1434.5	1415.8	1446.6	1415.8	1426.1
Total per cow per day	23.0	22.4	23.0	22.8	22.5	23.0	22.5	22.6

TEMPERATURE OF STABLE AND YIELD OF MILK FOR EACH COW PER WEEK.

Periods.	Temperature of stable.	Yield of Milk per Cow. Cow No. 1.	Cow No. 2.	Cow No. 3.	Total Cows 1–3.	Cow No. 4.	Cow No. 5.	Cow No. 6.	Total Cows 4–6.
	Deg.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
I—February 23—March 14.									
First week	41	87.1	112.0	113.1	312.2	119.1	124.4	108.4	351.9
Second week	45	83.5	107.8	112.4	303.7	121.4	131.1	109.0	361.5
Third week	41	81.9	106.0	111.4	299.3	122.0	128.4	112.6	363.0
Total		252.5	325.8	336.9	915.2	362.5	383.9	330.0	1076.4
II—March 15—April 4.									
First week	44	87.1	107.9	115.5	310.5	121.0	120.9	103.5	345.4
Second week	44	92.0	108.5	118.5	319.0	121.5	112.8	104.1	338.4
Third week	49	88 9	108.1	120.9	317.9	121.4	114.4	105.3	341.1
Total		268.0	324.5	354.9	947.4	363.9	348.1	312.9	1024.9
III—April 5—April 25.									
First week	50	90.1	101.5	118.5	310.1	125.8	104.8	102.6	333.2
Second week	56	88.5	100.4	119.1	308.0	130.6	102.0	100.5	333.1
Third week	55	86.0	98.3	120.3	304.6	128.9	99.1	107.6	335.6
Total		264.6	300.2	357.9	922.7	385.3	305.9	310.7	1001.9

AVERAGE COMPOSITION OF MILK FOR LAST FIVE DAYS OF EACH PERIOD.

	Cow 1.		Cow 2.		Cow 3.		Cow 4.		Cow 5.		Cow 6.	
	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.
	%	%	%	%	%	%	%	%	%	%	%	%
Period I	14.79	5.14	14.13	5.09	14.48	5.08	14.68	5.07	14.34	4.69	15.04	5.35
Period II	14.49	5.08	13.56	4.90	14.15	5.14	14.55	4.96	15.14	5.09	15.46	5.75
Period III	14.79	5.16	14.03	5.22	14.49	5.28	14.25	4.71	15.62	5.07	15.54	5.88

TOTAL YIELD OF MILK, SOLIDS AND FAT FOR EACH COW FOR EACH PERIOD.

	Period.	Cow.	Weight gained.	Weight lost.	Milk.	Solids.	Fat.
			lbs.	lbs.	lbs.	lbs.	lbs.
Ration I—Bran	I	1	...	4	252.5	37.4	13.0
		2	......	18	325.8	46.0	16.6
		3	.. ...	4	336.9	48.8	17.1
	II	4	20	......	363.9	53.0	18.1
		5	31	......	348.0	52.7	17.7
		6	55	......	312.9	48.4	18.0
	III	1	... ..	18	264.6	39.1	13.7
		2	14	.....	300.1	42.1	15.7
		3	12	.....	357.9	51.9	18.9
Ration II—Oats	I	4	......	27	362.5	53.2	18.4
		5	12	......	383.9	55.0	18.0
		6	......	23	330.0	49.6	17.7
	II	1	29	.....	268.0	38.8	13.6
		2	35	......	324.5	44.0	15.9
		3	25	......	354.9	50.2	18.2
	III	4	3	......	385.3	54.9	18.1
		5	......	11	305.9	47.8	15.5
		6	......	25	310.8	48.3	18.3

TOTAL YIELD OF EACH LOT OF COWS FOR EACH PERIOD, AND AVERAGE DAILY YIELD FOR EACH COW.

RATION.	Period.	Weight gained.	Weight lost.	Milk.	Total solids.	Butter fat.
		lbs.	lbs.	lbs.	lbs.	lbs.
Bran—Lot I	I	......	26	915.2	132.2	46.7
Average daily yield	.....	....	....	14.5	2.1	0.7
Bran—Lot II	II	106	....	1024.83	154.02	53.6
Average daily yield	.....	....	....	16.3	2.4	0.9
Bran—Lot I	III	8	......	922.6	133.1	48.2
Average daily yield	....	....	.....	14.6	2.1	0.8
Oats—Lot II	I	....	38	1076.4	157.9	54.1
Average daily yield	.....	... .	....	17.1	2.5	0.9
Oats—Lot I	II	89	....	947.4	133.0	47.8
Average daily yield	....	....	......	15.0	2.1	0.8
Oats—Lot II	III	......	21	1001.9	151.0	51.9
Average daily yield	.....	....	....	15.9	2.4	0.8

TOTAL YIELD OF MILK, TOTAL SOLIDS AND FAT WITH EACH RATION

	Milk.	Total solids.	Butter fat.
	lbs.	lbs.	lbs.
When ground oats were fed	2026	442	154
When bran was fed	1863	419	149

These results show a slightly larger yield when oats were fed than when bran was fed, but the differences are not sufficiently large for one to say that oats have a greater feeding value than bran. Changes in temperature of the stable, and other things that affect the condition of cows may cause even greater differences in yield of milk and butter fat than those shown in this experiment.

We, however, would have a right to infer that ground oats practically have a feeding value equal to bran, and when selling at about the same price, can be profitably substituted for it.

Their mechanical condition is such that they are equally good to mix with heavier feeds like corn, cotton seed, and gluten meals.

NUTRIOTONE FOR THE PRODUCTION OF MILK.

A feeding trial was undertaken with the above mentioned condiment, not with the expectation of obtaining any marked results, one way or the other, but as an object lesson to farmers who are spending their money for articles of that nature.

Nutriotone was taken in preference to any other compounds, not because it is believed to be any worse or better than any other of a like nature, but for the reason that it is being very extensively advertised and persistently sold by the company's agents, at the present time, not only as a curative agent, but as a stimulant to the production of flesh and milk. This impression seems to be substantiated by many inquiries, which have been made either verbally or by letter, to the station office during the past year. The company's agent in conversation with the writer denied that it was now being sold for any thing more than a tonic to be fed animals out of condition, but an inspection of the advertising matter, particularly the testimonials, would seem to indicate that a different argument is used to the consumer. We have here at the Station a two pound package which was recently sent in for examination. Upon this package are printed the following directions: "For Horses,—If your horse is in good condition, one large tablespoonful added to the food, twice daily, will keep him so with less grain. If in poor condition, blood out of order, hidebound, off his feed, has heaves, worms, etc., two tablespoonfulls mixed with each feed will soon put the horse in a thriving condition. Cows—Give two large tablespoonfuls with each feed. This will produce a great increase of much richer milk. Bullocks—Use two large tablespoonfuls for each feed and they will fatten in less time, with less expense and produce beef much superior in quality. They will have good appetites and not cloy."

From the foregoing directions it would certainly be impossible for one to get any other impression than that the Thorley Food Company, in its desire to increase the sale of its goods, is recommending them for use at all times whether the animals are in good or poor condition.

This experiment furnishes no evidence as to the value of nutriotone as a medicine. In fact, if the Station had been convinced that it was only being sold as such, the investigation would never have been undertaken. We do not, however, believe in purchasing these compounds as tonics or medicines for two reasons. One can tell nothing as to the quality, quantity, or effect of the ingredients they contain. The cost is, as a rule, about double what the drugs would cost bought alone without the filler.

If an animal is out of condition and really needs a tonic, the following could be given with safety and would probably be more effective than nutriotone. Pulverized gentian, 1 lb.; pulverized ginger, 1-4 lb.; pulverized saltpeter, 1-4 lb.; pulverized iron sulphate, 1-2 lb. Mix, and give one tablespoonful in the feed once a day for ten days. Omit for three days, then give ten days more. This mixture can be obtained for twenty cents a pound and has probably more than four times the value of most condimental foods in our markets, as a tonic for the reason it contains no filler like linseed meal or bran.

Other investigators have given this subject of condimental foods some attention.

Sir John B. Laws at Rothamstead, England, more than 50 years ago made thorough investigations in feeding trials and decided that there was no profit in feeding them. An experiment with nutriotone was reported by the Vermont Station Annual Report, 1894, page 150, in which seven Jersey cows were fed five periods of two weeks each. The hay and grain ration were the same throughout the trials. The prescribed amount of nutriotone was fed in the first, third and fifth periods. In the second period no nutriotone was fed and in the fourth two spoonfuls of linseed meal to each feed were substituted for it. The following table shows the total yield of milk and fat and the average per cent of fat for each period:

		Pounds of milk.	Per cent of fat.	Pounds of fat.
January 24—February 6.	Nutriotone fed	1554	5.47	84.78
February 7—20	No nutriotone fed	1566	5.55	86.83
February 21—March 6	Nutriotone fed	1514	5.42	82.02
March 7—20	Linseed meal fed	1531	5.37	82.22
March 21—April 3	Nutriotone fed	1449	5.45	78.96

For experiments, the results of which are given in the following tables, five good Jersey cows fresh in milk were used. They were known by the numbers 1, 2, 3, 4, 5. They were feed liberal rations of hay and grain in proportion to their size. Cows 1, 4 and 5 received a daily ration of 18 lbs. of timothy hay and 8 1-2 lbs. mixed grain per animal. Cows 2 and 3 received 20 lbs. timothy hay and 10 lbs. of mixed grain per day, for a ration. The grain mixture consisted of: Linseed meal (new process), 5 lbs.; corn meal, 2 lbs.; wheat bran, 3 lbs. The same care was used in making these experiments as in all others. The daily rations and milk produced were carefully weighed. Samples of the milk were taken the last five days of each period and analyzed, the averages of these results were taken as the average for the period in which they were obtained.

MILK YIELD PER WEEK FOR EACH COW FOR EACH PERIOD AND AVERAGE TEMPERATURE OF STABLE.

	Temperature of stable.	Milk Produced by Cows.					
		1.	2.	3.	4.	5.	Total.
October 24—November 14.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
First week	54°	141.2	200.3	188.8	162.4	142.7	835.4
Second week	53°	131.9	208.8	188.3	158.6	142.3	829.9
Third week	52°	125.7	190.0	177.0	150.2	134.1	777.0
November 15 to December 5.							
First week	46°	130.1	179.6	167.4	151.0	127.7	755.8
Second week	46°	128.6	185.0	166.6	151.5	129.7	761.4
Third week	44°	124.8	179.8	161.6	155.1	125.0	746.3
December 6 to 26.							
First week	48°	124.9	168.5	157.3	150.0	122.5	723.2
Second week	43°	120.9	170.0	151.8	146.2	118.3	707.2
Third week	37°	115.0	164.6	148.1	142.9	119.4	690.0

AVERAGE COMPOSITION OF MILK OF EACH COW WHEN NUTRIOTONE WAS FED AND WHEN IT WAS NOT FED.

Cows.	1.		2.		3.		4.		5.	
	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.
	%	%	%	%	%	%	%	%	%	%
No nutriotone	13.60	4.58	13.76	4.25	13.70	4.32	13.81	4.00	14.57	5.02
Nutriotone	13.75	4.52	13.77	4.35	13.77	4.39	13.83	4.11	14.62	5.02

YIELD OF MILK AND BUTTER-FAT FOR EACH COW FOR EACH PERIOD.

		Cows.					
		No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	Total
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Period I—21 days—without nutriotone.	Milk	398.8	599.1	554.1	471.2	419.1	2442.3
	Fat	18.7	26.6	23.8	20.1	21.3	111.6
Period II—21 days—with nutriotone.	Milk	383.5	544.4	495.6	457.6	382.4	2263.5
	Fat	17.3	23.7	22.2	18.8	19.2	101.3
Period III—21 days—without nutriotone.	Milk	360.8	503.1	457.2	439.1	360.2	2120.4
	Fat	16.2	20.4	19.8	16.4	17.9	90.7

SUMMARY OF RESULTS WITH AND WITHOUT NUTRIOTONE.

	Milk.	Butter fat.
	Lbs.	Lbs.
Average for twenty-one days without nutriotone	2,281	101
Average for twenty-one days with nutriotone	2,264	101

The gradual shrinkage in these experiments is due to advance in period of lactation. In neither of these cases did nutriotone seem to have any effect, favorable or unfavorable. The slightly smaller milk flow with nutriotone does not mean anything in particular except to add increased emphasis to the falseness of the claim that two large tablespoonfuls fed with each feed "will produce a great increase of much richer milk." Of course the money spent for nutriotone in other cases was a dead loss. While there may be instances in which the purchase of a condimental food is financially profitable, it is significant that no exact experiments, conducted by disinterested parties, have shown a return equal to the cost.

EFFECTS OF TUBERCULIN ON TUBERCULOUS COWS.

F. L. Russell.

Since June 10, 1892, we have been testing cows with tuberculin, and during nearly all this time have had some tuberculous animals under observation. The tests, together with the autopsies held, have impressed upon us the fact that tuberculin is a very delicate agent for determining the presence of tuberculosis. It is very doubtful if cows ever react under a properly made tuberculin test unless they have tuberculosis. On the other hand, however, it is very evident that cows sometimes have tuberculosis or at least tuberculous growths in their bodies, and yet fail to react under the tuberculin test.

Others have observed that animals in an advanced stage of the disease sometimes fail to react, but we have had no experience of this sort. Unfortunately or otherwise, according to the standpoint from which we view the matter we have not treated many animals that were in a really bad physical condition. But during all our experience with tuberculin in testing cows we have been struck with the frequency of the failure of tuberculin to cause reaction in cows that were but slightly diseased. They will react at one time and not at another so that it is impossible to predict with any degree of certainty what the result of injecting tuberculin into a slightly diseased cow will be.

The results of the tests of animals with tuberculin extending over considerable periods of time are summed up as concisely as practicable, in a table at the end of this paper. A few of the most interesting and striking cases are discussed in the text immediately following.

One cow, Agnes, injected in June, 1892, underwent a plain reaction, and in the light of subsequent experience, we are bound to believe she was diseased at that time. The next time she was tested was a year and two days later when she failed to react.

During the next three years she was tested six times at intervals varying from twelve days to seven months and nineteen days, and she did not react until the last time she was tested, April 2, 1895, when she underwent what might be called a typical reaction with a maximum temperature of 106.3.

This case compels us to one of four conclusions: Either the test made in June, 1892, was misleading and the cow was not tuberculous at that time, or she recovered and later, in 1895, contracted the disease again; or she was diseased from June, 1892, to May, 1895, and repeated tests with tuberculin failed to reveal the fact; or the tuberculin injected in June, 1892, rendered her so tolerant of the drug that the tuberculin injected a little more than a year later had no effect. A few days before this cow was tested the last time, her udder was badly bruised—probably by the cow next to her stepping on it. For a time under the usual treatment she seemed to be making a good recovery from the injury and then steadily and rapidly grew worse. The swelling extended to the other quarter of the uddder on the same side, she developed a cough and was rapidly losing strength and flesh when she was killed, May 7, 1896. The autopsy revealed tuberculosis involving nearly all of one side of the udder, quite an area of one lung, the inguinal and mediastinal and many of the mesenteric lymphatic glands. There was no doubt but the disease was making rapid progress.

Another case of some interest is a nineteen months old steer (No. 4) that had been tested three times with intervals of seven and one-half and four and one-half months. The last test was made twenty-six days before the autopsy and although the highest temperature observed at any test was 103, the autopsy revealed tuberculosis involving one mediastinal gland and a small area in the right lung. In both localities the tubercular tissue had undergone cheesy degeneration to such an extent as to leave no room for the idea that the disease was contracted after the last test was made only twenty-six days before.

Cows Nos. 5 and 6, were small, grade cows, related to each other and almost identical in appearance. They were always tested the same day and the results were similar to a remarkable degree. When first tested, August 17, 1894, neither reacted. Tested again January 8, 1895, both reacted, and both reacted again January 25, 1895. They were tested February 6, February 22, March 11, April 20, June 8 and August 1, and did not react at any of these times. They were killed August 22, 1895. The lungs of No. 5 and the lungs and a mediastinal gland of No. 6 contained small cheesy abscesses.

Dunkard Girl was tested first November 21, 1893, before she was a year old. Up to August, 1895, she had been tested six times without reacting. August 13, 1895, she reacted with a temperature of 107.4. August 29, 1895, she was tested again and reacted with exactly the same maximum temperature, 107.4. During September, 1895, she was tested twice and did not react. October 8, 14 days after the last test in September, she reacted with a maximum temperature of 105. She was tested October 19 and October 31, and failed to react. Tested November 20, she reacted with a temperature of 104.8. December 7 she did not react. January 3, 1896, she reacted with a temperature of 106.2. From January 3, 1896, to January 13, 1897, when she was tested the last time, she was given eight tests. The longest intervals being one and one-half month, and four and one-half months, but she failed to react after January 3, 1896. January 15, 1897, she was killed and tubercular lesions of the right lung and of two mediastinal glands were found.

August 13, 1895, a two-months-old heifer Kate, was tested and failed to react. February 14, 1896, she was tested again and did react. From that time to November 3, 1896, she was tested eight times at various intervals, and at each time failed to react, and she has not been tested since.

In considering these cases and others, the records of which are given in the accompanying tables, we notice that, although the animals were all undobtedly tuberculous, out of the 116 tests made, there were 33 reactions and 83 failures. Steer No. 4 did not react at all, but we count the last time he was tested among the failures to react, as the autopsy held twenty-six days later proved that he must have been diseased at the time that test was made.

Why is it that these animals were sometimes affected by tuberculin and at other times not affected?

The amount of tuberculin used in making the injections has been uniform for the same stage of maturity, yet the results have differed widely. In these cases, where the animals were so slightly diseased that their condition could not be detected by a physical examination, the results have differed so widely that we are forced to the conclusion that we can never tell whether a slightly diseased animal will react to the tuberculin test or not. A reaction may be obtained to-day and again next month, or as in the case of the cow Agnes, reaction may fail for nearly three years and then there be a very decided reaction.

We do not believe that tuberculin is poisonous for cows one day and not another, but our experience might lend some color to such a conclusion. That there is some law underlying the whole matter we believe must be true, but we have not yet seen any satisfactory statement of what the law is.

The theory has been quite generally advanced that aside from a possible curative action, one dose of tuberculin influences the action of the next dose even though it is injected after a considerable interval, the length of time being variously estimated. In view of the facts that animals do not usually acquire a tolerance, either temporary or permanent, for vegetable poisons as the result of one moderate dose; that some tuberculous animals react repeatedly to tuberculin and others do not; and that the intervals between reactions even in our limited experience varies from two days to more than a year, we see no grounds for supporting the theory that the failure of tuberculous animals to react to tuberculin is due to an acquired tolerance of tuberculin.

It is not a wild assumption that the growth of tubercle bacilli in diseased cows keeps their systems charged with tuberculin nearly up to and sometimes a little beyond the point where it manifests its poisonous effects in elevation of temperature. Such animals, charged to the danger point with tuberculin, readily react to a slight addition. The cow that has been taken at a disadvantage and has contracted tuberculosis and then so far recovers as to hold the disease in check, may be compared to the well cow so far as the action of tuberculin is concerned, since her system is free, or comparatively free, from tuberculin and no reaction follows the giving of the usual test dose.

Our experience has suggested to us the possibility that the failure of tuberculin to cause reaction in tuberculous cows at times may be due to the fact that the disease is not making steady progress.

In the following table there are given the condensed results of the more important cases studied by the Station. As stated in another part of this report* the Station has a herd of ten cows, which have reacted at least once, under investigation. The results here presented are given as a contribution to knowledge upon this important question and are not presented to prove or disprove any particular theory.

See page 14 this Report.

TABLE GIVING THE RESULTS OF TESTS WITH TUBERCULIN MADE AT THE STATION DURING THE YEARS 1892 TO 1896.

DATE OF TEST.	Number of days since the last test was made.	Temperature at the time the tuberculin was injected.	Maximum temperature on the day after the injection.	Rise or decline (—) of temperature.	Remarks.
		Deg.	Deg.	Deg.	
Topaz.					
February 14, 1896.....	First test..	102.1	**105.3**	**3.2**	**Reaction.**
March 8, 1896	23	101.8	102.2	.4	No reaction.
March 13, 1896	5	102.2	102.8	.6	No reaction.
March 21, 1896	8	102.3	101.8	—.5	No reaction.
May 1, 1896	41	102.	101.9	—.1	No reaction.
July 2, 1896....	62	102.6	101.9	—.7	No reaction.
August 18, 1896	47	102.4	102.	—.4	No reaction.
September 15, 1896....	28	102.2	Temperature not taken.		
November 3, 1896.....	49	101.8	101.8	... .	No reaction.
December 9, 1896. ..	36	101.8	102.2	.4	No reaction.
January 13, 1897	35	102.	**105.2**	**3.2**	**Reaction.**
January 27, 1897	14	101.6	102.9	1.3	No reaction.
February 17, 1897	21	100.9	101.6	.7	No reaction.
Merrill.					
May 24, 1893...........	First test..	101.9	**105.5**	**3.6**	**Reaction.**
November 14, 1893...	175	99.4	102.2	2.8	No reaction.
December 1, 1893. ...	17	100.7	100.4	.3	No reaction.

RESULTS OF TESTS WITH TUBERCULIN—CONTINUED.

DATE OF TEST.	Number of days since the last test was made.	Temperature at the time the tuberculin was injected.	Maximum temperature on the day after the injection.	Rise or decline (—) of temperature.	Remarks.
		Deg.	Deg.	Deg.	
Agnes.					
June 21, 1892	First test..	101.	**104.4**	**3.4**	**Reaction.**
June 23, 1893	367	101.4	102.2	.8	No reaction.
December 25, 1893 ...	188	101.	101.4	.4	No reaction.
August 16, 1894	231	101.8	102.	.2	No reaction.
January 8, 1895	145	100.9	102.	1.1	No reaction.
February 6, 1895	29	100.9	101.3	.4	No reaction.
April 20, 1895	73	101.3	**106.3**	**5.0**	**Reaction.**
Steer 4.					
December 27, 1893....	First test..	102.4	103.	.6	No reaction.
August 17, 1894	233	103.	102.1	—.9	No reaction.
January 8, 1885.......	144	101.4	102.8	1.4	No reaction.
Cow 5.					
August 17, 1894	First test..	100.9	102.	1.1	No reaction.
January 8, 1895........	144	100.7	**105.2**	**4.5**	**Reaction.**
January 25, 1895......	17	101.1	**105.4**	**4.3**	**Reaction.**
February 6, 1895......	12	100.6	101.8	1.2	No reaction.
February 22, 1895.....	16	101.8	102.	.2	No reaction.
March 12, 1895	18	100.6	102.	1.4	No reaction.
April 20, 1895	39	101.	102.4	1.4	No reaction.
June 8, 1895	49	101.4	101.	—.4	No reaction.
August 1, 1895	54	101.7	102.	.3	No reaction.
Cow 6.					
August 17, 1894	First test..	101.8	102.5	....	No reaction.
January 8, 1895	144	100.8	**104.4**	**3.6**	**Reaction.**
January 25, 1895......	17	101.3	**104.**	**2.7**	**Reaction.**
February 6, 1895......	12	101.9	102.2	.3	No reaction.
February 22, 1895.....	16	101.6	101.6	.0	No reaction.
March 12, 1895	18	100.8	102.4	1.6	No reaction.
April 20, 1895	39	101.3	101.2	—.1	No reaction.
June 8, 1895	49	101.3	102.	.7	No reaction.
August 1, 1895	54	101.7	102.	.3	No reaction.
Dunkard Girl.					
August 13, 1895	116	101.	**107.4**	**6.4**	**Reaction.**
August 29, 1895	16	101.6	**107.4**	**5.8**	**Reaction.**
September 4, 1895....	6	101.4	102.5	1.1	No reaction.
September 14, 1895 ...	10	102.6	101.4	—1.2	No reaction.
October 8, 1895........	424	102.7	**105.**	**2.3**	**Reaction.**
October 19, 1895.......	10	101.6	Temperature not taken.		
October 31, 1895.......	12	101.7	102.4	.7	No reaction.
November 20, 1895 ...	20	101.8	**104.8**	**3.**	**Reaction.**
December 7, 1895.....	17	101.	101.9	.9	No reaction.
January 3, 1896	27	102.	**106.2**	**4.2**	**Reaction.**
January 10, 1896	7	101.6	101.2	—.4	No reaction.
January 24, 1896	14	101.3	101.2	—.1	No reaction.
February 19, 1896....	26	101.5	100.9	—.6	No reaction.
July 2, 1896..........	134	102.	103.	1.	No reaction.
August 18, 1896	47	101.7	101.6	—.1	No reaction.
September 16, 1896 ...	29	101.7	Temperature not taken.		
November 3, 1896.....	49	103.	101.4	—1.6	No reaction.
January 13, 1897	72	101.5	102.4	.9	No reaction.

RESULTS OF TESTS WITH TUBERCULIN—CONTINUED.

DATE OF TEST.	Number of days since the last test was made.	Temperature at the time the tuberculin was injected.	Maximum temperature on the day after the injection.	Rise or decline (—) of temperature.	Remarks.
		Deg.	Deg.	Deg.	
Kate.					
February 14, 1896....	185	100.3	**105.3**	**5.**	**Reaction.**
March 8, 1896	23	101.4	102.8	1.4	No reaction.
March 13, 1896	5	100.4	102.6	2.2	No reaction.
March 21, 1896	8	101.6	102.	.4	No reaction.
May 1, 1896............	41	101.1	101.8	.7	No reaction.
July 2, 1896...	62	102.8	102.5	—.3	No reaction.
August 18, 1896	47	101.7	102.3	.6	No reaction.
September 15, 1896...	28	101.3	Temperature not taken.		
November 3, 1896.....	49	103.	103.	....	No reaction.
Mina D.					
April 30, 1896	72	101.2	**105.9**	**4.7**	**Reaction.**
July 2, 1896	63	101.7	**105.8**	**4.1**	**Reaction.**
July 7, 1896	5	101.3	102.7	1.4	No reaction.
August 18, 1896	42	101.8	**104.8**	**3.**	**Reaction.**
August 20, 1896	2	102.7	102.7	....	No reaction.
August 29, 1896	9	102.3	102.7	.4	No reaction.
September 15, 1896 ...	17	101.8	Temperature not taken.		
November 3, 1896.....	49	101.1	102.3	1.2	No reaction.
Ruth C.					
February 14, 1896.....	100	101.2	**106.**	**4.8**	**Reaction.**
March 8, 1896	23	100.8	**103.6**	**2.8**	**Reaction.**
March 13, 1896	5	101.7	100.8	—.9	No reaction.
March 21, 1896	8	101.6	101.7	.1	No reaction.
April 30, 1896	40	103.	101.6	—1.4	No reaction.
July 2, 1896...........	63	102.2	**105.2**	**2.9**	**Reaction.**
July 7, 1896......... ...	5	101.5	101.3	—.2	No reaction.
August 18, 1896	42	102.7	**104.3**	**1.6**	**Reaction.**
August 20, 1896	2	103.4	101.8	—1.6	No reaction.
August 29, 1896	9	103.	102.2	—.8	No reaction.
September 15, 1896 ...	17	102.	Temperature not taken.		
November 3, 1896.....	49	102.1	102.5	.4	No reaction.
December 9, 1896.....	36	101.3	101.2	—.1	No reaction.
January 13, 1897	35	101.6	102.	.4	No reaction.
January 27, 1897......	14	100.6	103.	2.4	No reaction.
February 17, 1897.....	21	100.8	101.3	.5	No reaction.
Agnes 2.					
February 14, 1896.....	100	101.8	**106.**	**4.2**	**Reaction.**
March 8, 1896	23	102.6	**104.**	**1.4**	**Reaction.**
March 13, 1896	5	101.	**103.2**	**2.2**	**Doubtful.**
March 21, 1896	8	101.4	Temperature not taken.		
April 30, 1896	40	101.2	100.	—1.2	No reaction.
July 2, 1896......	63	102.7	**103.7**	**1.**	**Doubtful**
August 18, 1896........	46	102.1	102.3	.2	No reaction.
September 15, 1896 ...	28	101.8	Temperature not taken.		
November 3, 1896.....	49	102.2	102.2	....	No reaction.
Hallie.					
February 14, 1896.....	100	101.7	**106.6**	**4.9**	**Reaction.**
March 8, 1896..........	13	102.	**105.6**	**3.6**	**Reaction**
March 13, 1896	5	102.2	**103.5**	**1.3**	**Doubtful.**
March 21, 1896	8	100.2	102.2	2.	No reaction.
April 30, 1896	40	103.1	**104.3**	**1.2**	**Doubtfal.**
July 2, 1896...........	63	101.8	**103.4**	**1.6**	**Doubtful**
July 7, 1896.......... .	5	101.3	101.7	.4	No reaction.
August 18, 1896	42	102.	**105.2**	**3.2**	**Reaction.**
August 20, 1896	2	101.8	**105.1**	**3.3**	**Reaction.**

RESULTS OF TESTS WITH TUBERCULIN—CONCLUDED.

DATE OF TEST.	Number of days since the last test was made.	Temperature at the time the tuberculin was injected.	Maximum temperature on the day after the injection.	Rise or decline (—) of temperature.	Remarks.
		Deg.	Deg.	Deg.	
August 29, 1896.... . .	9	101.2	102.	.8	No reaction.
September 15, 1896 ...	17	101.7	Temperature not taken.		
November 2, 1896.....	48	101.7	101.6	.1	No reaction.
February 17, 1897....	97	101.6	**105.3**	**3.7**	**Reaction**
Grace 2.					
February 14, 1896.....	100	99.6	**106.5**	**6.9**	**Reaction.**
March 8, 1896	23	102.	**105.5**	**3.5**	**Reaction.**
March 13, 1896	5	102.	102.8	.8	No reaction.
April 30, 1896..........	48	100.	100.2	.2	No reaction.
July 2, 1896	63	102.3	**104.7**	**2.4**	**Reaction.**
July 7, 1896.......	5	101.7	101.8	.1	No reaction.
August 18, 1896	42	102.	102.	....	No reaction.
September 15, 1896 ...	28	101.4	Temperature not taken.		
November 3, 1896....	49	101.5	102.2	.7	No reaction.
December 9, 1896.....	37	101.4	102.5	1.1	No reaction.
January 13, 1897	35	102.1	102.	.1	No reaction.
January 27, 1897......	14	100.8	102.4	1.6	No reaction.
February 17, 1897.....	21	101.5	**104.1**	**2.1**	**Reaction.**
Melinda 2.					
February 14, 1896	100	101.5	**106.**	**4.5**	**Reaction.**
March 8, 1896	23	101.2	**104.**	**2.8**	**Reaction.**
March 13, 1896	5	99.8	100.9	1.1	No reaction.
March 21, 1896	8	101.7	101.4	—.3	No reaction.
May 1, 1896............	41	100.3	101.4	1.4	No reaction.
July 2, 1896.....	62	102.	102.7	.7	No reaction.
August 18, 1896	47	101.9	102.	.1	No reaction.
September 15, 1896 ...	28	101.3	Temperature not taken.		
November 3, 1896...	49	102.	102.1	.1	No reaction.
December 9, 1896....	36	99.	101.4	2.4	No reaction.
January 13, 1897	35	102.	102.8	.8	No reaction.
January 27, 1897	14	100.5	102.5	2.	No reaction.
February 17, 1897.....	21	102.4	102.2	.2	No reaction.
Trilby.					
February 14, 1896.....	First test..	102.	**106.3**	**4.3**	**Reaction.**
March 8, 1896	23	101.	**105.3**	**4.3**	**Reaction.**
March 13, 1896	5	101.7	103.2	1.5	No reaction.
March 21, 1896	8	101.8	102.1	.3	No reaction.
May 1, 1896.....	41	102.1	101.6	—.5	No reaction.
July 2, 1896............	62	102.7	**105.5**	**2.8**	**Reaction.**
July 7, 1896............	5	102.	101.7	—.3	No reaction.
August 18, 1896........	42	102.5	103.2	.7	No reaction.
September 15, 1896 ...	28	101.9	Temperature not taken.		
November 3, 1896	49	102.	102.	....	No reaction.
December 9, 1896.....	36	102.	102.2	.2	No reaction.
January 13, 1897	35	101.8	102.	.2	No reaction.
January 27, 1897	14	100.8	102.7	1.9	No reaction.
February 17, 1897	21	100.4	102.	1.6	No reaction.

ORCHARD NOTES.

W. M. MUNSON.

THE STATION ORCHARDS.

In reponse to oft repeated requests for information as to the exact condition of the orchard at the Experiment Station, a somewhat detailed statement is herewith given. In justice to ourselves, however, it should be said that we are not ready to draw conclusions, and this statement is but preparatory to a fuller discussion in a future report.

I. THE PLUM ORCHARD.

The nucleus of the plum orchard was started in the spring of 1889, when several varieties were procured and set in nursery rows. Several more were added in 1890. The effects of the severe winter of 1890 and 1891 were detailed in the annual report of the Experiment Station for 1891.

In 1892 the trees were removed from nursery rows to their present location and several others were added. Some of these have done well; others, as was expected, have failed.

The orchard is situated on heavy clay loam with stiff clay subsoil. The surface drainage is good, but as the land has not been tilled for some years, it was not in good condition for the orchard.

The following notes represent the condition of the orchard at the close of the season in 1896. The numbers refer to the Station records.

American Eagle, 56—Set in 1893. Moderately vigorous. Wood not matured. Kills back somewhat every year.

Arch Duke, 65—Young tree set in 1895. Failed to start. This place was originally occupied by Wild Goose.

Bunker Hill, 29 and 30—29, moderately vigorous, upright. A black knot found on the side of the tree. 30, vigorous, upright, healthy. A good tree.

Cheney, 79 and 80—79, young tree set in 1895. Vigorous. Wood not quite mature. 80, set in 1892. Very vigorous, upright. Wood not fully matured. Top broken off below the branches in the fall of 1893. Now making a good growth.

Coe's Golden, 8, 9 and 10—Moderately vigorous. Fruit spurs well developed. Small amount of fruit on No. 9 in 1893.

Czar, 50—Set in 1895. Has made very slow growth.

Damson, 20—Moderately vigorous, upright. Full crop of fruit in 1896.

DeCaraduc, 69—Set in 1892. The original tree was killed to the ground. Present top is a sprout from the base. The variety is not hardy.

Deep Creek, 45—Set in 1893. Small tree making a weak growth.

De Soto, 55—Set in 1893. Very vigorous, hardy. Wood well matured.

Duane Purple, 17 and 18—17, very vigorous, upright, strong, hardy, healthy. 18, same remarks apply as to 17. Centre of the tree was removed in 1895, but wound is healing well.

Early Red, 95 and 96—A Russian variety. Both are vigorous, upright, hardy. 96, bore a full crop of fruit in 1896. Growth checked.

Field, 35—Moderately vigorous. In good condition. Wood not quite matured. Blossomed, but bore no fruit, in 1896.

French Damson, 33—Set in 1893. Moderately vigorous. Young wood not fully matured.

Forest Garden, 41 and 42—41 set in 1895, replacing the original one of the same variety. Vigorous, hardy, healthy. 42, set in 1893. Very vigorous, hardy. Bore a few fruits in 1896.

German Prune, 2—Hardy, vigorous. In good condition.

Gueii, 23—Young tree set in 1894. Very vigorous. In good condition.

Hawkeye, 59—Set in 1893. Hardy, vigorous, strong. Wood well matured. Very few fruits in 1896.

Hudson River Purple Egg, 31—Very vigorous, upright, hardy. In good condition.

Hungarian Prune, 72—Set in 1892. Moderately vigorous, upright, hardy.

Imperial Gage, 22—Very vigorous, upright. In good condition.

Italian Prune, 3 and 13—Hardy, moderately vigorous. In good condition. Few fruit spurs.

Jefferson, 14—Injured and part of the tree removed in 1894. Tree now moderately vigorous and healthy. Fruit spurs well developed.

Lincoln, 38—Set in 1893. A small, misshapen tree, but now growing well.

Lombard, 1—Vigorous, healthy; one side broken by careless workmen.

Lone Star, 57—Set in 1893 and again in 1895. Killed both times.

Marianna, 51 and 52—Set in 1892. Very vigorous, hardy, spreading. Bore small amount of fruit in 1896.

McLaughlin, 15, 24, 25, and 26—15, badly checked in 1893. Now making a strong, vigorous growth. 24, small, weak tree. Will be replaced. 25, badly checked when removed from the nursery, but now making a vigorous growth. 26, moderately vigorous, spreading. In good condition. One black knot was found on this tree.

Newman, 65—Very vigorous, but tender. Kills back every winter. Worthless for this location.

No. 19 Orel, 81 and 82—A Russian variety of moderately vigorous, upright growth. Perfectly hardy. One black knot found. 82, injured in the trunk, and will probably not be long lived.

No. 20 Orel, 83 and 84—83, the original tree died. Sprouts from the roots of questionable value. 84, vigorous, upright, hardy. No fruit as yet, but promises well for 1897.

Osage, 48—Killed back every year. Died in July, 1896.

Peter's Yellow Gage, 21—Moderately vigorous, upright. In good condition. Tops of shoots not quite matured in the autumn.

Pond's Seedling, 27—Very vigorous, upright grower. In good condition.

Pottawatomie, 44—Set in 1893. Killed back first winter. New top formed from the side shoots. Making a vigorous growth, but wood fails to mature. Not hardy.

Prince Englebert, 28—Vigorous, upright. In good condition.

Prince of Wales, 34—Set in 1893. Vigorous, upright. Young wood immature. One black knot found.

Purple Yosemite, 49—Young tree set in 1895. Very vigorous. Wood well matured. The original tree set in 1893, never started.

Quackenbos, 6—Strong, vigorous grower. In good condition.

Reine Claude, 7—A fine tree. Moderately vigorous. In good condition.

Robinson, 54—Set in 1893. Killed back every year. Wood not matured.

Rockford, 43—Set in 1895. Small tree making a good growth, but wood not quite mature.

Rolling Stone, 75 and 76—75, moderately vigorous, spreading, hardy. 76, making a very vigorous growth. In fine condition.

Saratoga, 40—Set in 1895. Moderately vigorous, healthy. Wood well matured.

Smith's Orleans, 16—Strong, vigorous, hardy. A fine tree. No fruit as yet.

Spaulding, 39—Set in 1895. Healthy. Making a moderately vigorous growth.

Van Buren, 32 and 60—60, very vigorous. Wood well matured. Blossomed, but matured no fruit in 1896. 32, young tree set in 1895.

Victoria, 67 and 68—67, set in 1892. Very vigorous, upright. Wood not well matured. Badly injured in the winter of 1893-4. Present top is from a sprout which started about six inches from the base. 68, vigorous, but not well matured. Growth four feet.

Voronesch Yellow, 93 and 94—A Russian variety, upright, vigorous, hardy. Slow in starting, but now making a vigorous growth. Has not fruited.

Washington, 12—Badly checked when removed from the nursery. Now in good condition. Very vigorous.

Weaver, 53—Set in 1894. Very vigorous, spreading, hardy. The original tree set in 1892 made a very vigorous growth and failing to mature the first year was killed by the hard winter.

Wild Goose, 64—Vigorous grower, but killed back every year. Dead in 1896.

White Nicholas, 97 and 98—97, very vigorous, upright, hardy. A good tree. Black knot found on one side of trunk. 98, bore a full crop of fruit in 1896. The fruit very closely resembles that of Early Red. It is possible that the two varieties were mixed in the nursery.

Wolf, 47, 73 and 74—Set in 1893. Very vigorous, hardy. Has borne no fruit.

Wyant, 77 and 78—77, hardy, vigorous. Fruit buds well developed. Bore small amount of fruit in 1896. Very late. 78, smaller tree than No. 77 because of injury when young.

Yellow Egg, 4 and 5—4, badly checked when removed. Now growing vigorously. Bore a few fruits in 1896. 5, tree injured, one-half dead, the other growing vigorously.

Yellow Transparent, 58—Set in 1893 and again in 1895. Killed both times.

The foregoing notes represent the condition of the plum orchard. The conditions were unfavorable at the time of starting the orchard and there have been many failures. From these failures some valuable lessons have been learned. Most of the standard varieties have proved hardy and are at present in a good thriving condition although few of them have yet fruited.

The Russian sorts have proved hardy and productive, but the quality of those which have fruited is inferior.

Of the varieties which have been found to be too tender for our winter climate we may note: American Eagle, DeCaraduc, Lone Star, Newman, Osage, Pottawatomie, Robinson, Victoria, Wild Goose and Yellow Transparent.

Of the standard varieties which are especially promising at the present time the following may be mentioned: Duane Purple, German Prune, Hudson River Purple Egg, Imperial Gage, Lombard, McLaughlin, Pond's Seedling, Smith's Orleans and Washington.

When the orchard comes into full bearing, the several varieties will be described more in detail.

II. THE APPLE ORCHARD.—STANDARD VARIETIES.

The nucleus of the orchard consisted of a number of trees set in nursery rows in 1890, before the work came under the direction of the writer. These trees were removed to a permanent location in the spring of 1891 and several varieties were added to the list. The soil on which this main orchard was set is variable, part being a heavy clay loam and part a light sand. Thorough cultivation has been given from the first, the land having been used as a vegetable garden.

The following table represents the present condition of the orchard:

PRESENT CONDITION OF STANDARD VARIETIES OF APPLES.

Name.	Habit.	Present Condition.	Growth in 1896.	Age at first fruiting.
			In.	Ys.
Akin		Young tree, set in 1894.		
Alexander	Upright, vigorous, spreading	Vigorous	15	5
Arctic	Very vigorous, spreading	Strong, healthy	20	6
Astrachan	Upright, vigorous	Strong, healthy	12	5
Chenango	Upright, vigorous	Strong, healthy	12	6
Fallawater	Vigorous, spreading, sturdy.	Strong, healthy	12	
Fameuse	Vigorous, spreading, sturdy.	Strong, healthy	18	5
Haas	Vigorous, spreading, sturdy.	Strong, healthy	15	5
Hurlbut	Moderately vigorous, upright	Strong, healthy	20	5
King of Tompkins	Very vigorous	Strong, healthy	15	
Mann	Moderately vigorous, upright	Weak	12	
Milding	Vigorous, upright, sturdy	Strong, healthy	16	
Northern Spy	Vigorous, spreading	Young tree, set in 1894.	6	
Nor'west'n Greening		Young, set in 1895	15	
Oldenburg	Upright, sturdy	Strong, full bearing	15	4
Peck's Pleasant	Low, spreading	Weak	10	
Pewaukee	Very vigorous, spreading	Healthy	18	5
Porter	Moderately vigorous, low, spreading	Healthy	16	
Princess Louise	Vigorous, upright	Healthy	18	5
Red Beitigheimer	Upright	Weak	6	5
Rolfe	Moderately vigorous, upright sturdy	Strong	10	
Shiawassee Beauty	Very vigorous, spreading	Strong	15	6
Stark	Vigorous, upright, spreading	Strong	12	
Thompson No. 24	Vigorous, upright, spreading	Strong	18	
Thompson No. 26	Vigorous, upright, spreading	Strong	24	
Thompson No. 29	Vigorous, upright, sturdy	Strong	12	
Thompson No. 43	Vigorous, willowy	Strong	12	
Wagener	Moderately vigorous	Strong	10	
Walbridge	Upright, vigorous, spreading	Strong	12	
Wealthy	Upright, vigorous, spreading	Strong	15	4
Westfield	Moderately vigorous	Strong	12	
Winesap	Vigorous, spreading	Strong	15	5
Wolf River	Vigorous, spreading	Strong	18	
Yellow Transparent.	Vigorous, spreading	Blighted	6	

The number of trees in the orchard at present is 130, about 30 having been removed on account of a new building. Of this number ten varieties are crabs, and the remainder, 34 varieties, consists mainly of standard varieties of recognized merit. The object in view in starting the orchard in this way was to have a number of the standard sorts for comparison. Many of these will be top-worked with other varieties.

With few exceptions the trees have thrived and proved hardy, although neither soil nor location are well suited to orcharding. Several sorts bore some fruit last season, and the present year many others came into bearing. Most of the varieties in this orchard are well known and require no special mention. Some of those not commonly grown may, however, be noticed in this connection.

Arctic—Tree very vigorous, upright, spreading. Fruit medium, roundish conical; greenish yellow, heavily overlaid with crimson on the sunny side, with splashes of a deeper shade and numerous light dots. Flesh yellowish, crisp, juicy, brisk sub-acid. Good. Bears a strong resemblance to Baldwin and will replace that sort in trying climates. The following notes from Mr. W. A. Taylor of the United States Department of Agriculture are of interest in this connection: "So far as we have been able to ascertain the original tree of Arctic apple was found growing on the farm of John H. Esseltyne, Cape Vincent. New York. Mr. Esseltyne sold the tree some years ago to O. K. Gerrish then of Geneva, N. Y., but now of Lakeville, Mass. After securing a crop of wood for propagation Mr. Gerrish destroyed the original tree to prevent theft of scions. It was therefore impossible to secure specimens of the fruit for examination after the variety was introduced by Mr. Gerrish until the trees sold by him came into bearing. In 1896 the variety bore in New York, Massachusetts, Vermont and Maine, as we received specimens from those states. We consider it a promising variety for market orchards in the north as it is apparently more resistant to the cold than Tompkins King or Baldwin."

Haas—A popular market variety from Missouri. Tree hardy, very vigorous, upright, productive; an early annual bearer. Fruit medium, oblate or slightly conical; skin smooth greenish yellow, shaded nearly over the whole surface with dark red. Flesh white, tender, juicy, brisk sub-acid. September, October.

Haynes' Sweet—A very vigorous, hardy sort, originating in Waldo county, Maine. Fruit large, oblong, yellow, washed and splashed with scarlet. Stem short, stout, in a broad, shallow, slightly russet cavity. Calyx open; basin shallow, slightly irrregular; core very large. Flesh rather coarse, yellowish, sweet. Good. September to January. This variety is perfectly hardy and vigorous as far north as Caribou. Its color is not bright enough to make it a valuable market sort.

Milding—A strong, hardy variety, originating in New Hampshire. Highly esteemed in Piscataquis county and wherever known. Fruit large, oblate, whitish-yellow, shaded, splashed and mottled with red; flesh light yellow, rather coarse but crisp, tender, juicy, sprightly sub-acid. December, January.

Munson Sweet—A vigorous productive variety of uncertain origin. Fruit medium, oblate, pale yellow often with a blush. Flesh yellowish, juicy, sweet. Highly esteemed wherever known. September to February.

Pewaukee—A seedling of Oldenburg, originating in Wisconsin. Tree hardy, vigorous, upright, spreading, an annual bearer and very productive. Fruit medium to large, roundish. Skin yellow splashed and mottled with red. Flesh white, juicy, brisk acid. Good for cooking. November to February.

Prolific Sweeting—One of the varieties imported from Russia by the Department of Agriculture in 1870. It is a beautiful yellow fruit of medium size. Somewhat resembles Yellow Transparent in form and color. Of this variety Dr. Hoskins writes: "It is the best fall sweet apple I am acquainted with, and I could sell almost unlimited quantities of trees and fruit if I had them. I am now propagating it on a large scale for my own planting." Season September to October.

Rolfe—A valuable early winter variety, originating at Guilford, Me. Tree hardy, vigorous, a good annual bearer. In protected places will thrive as far north as Caribou. Fruit medium to large, oblate, yellowish, shaded and splashed with red. Flesh white, fine grained, tender, sub-acid. December, January.

Shiawassee Beauty—Seedling of Fameuse, originating in Shiawassee county, Michigan. Larger and more oblate than Fameuse, otherwise resembling that variety. Flesh firm, white, tender, brisk sub-acid. October to January.

III. THE APPLE ORCHARD—RUSSIAN VARIETIES.

As stated in a former Report, one feature of our orchard work is the introduction of hardy fruits.

In the spring of 1890 about 75 varieties of Russian apples were procured from the Iowa Agricultural College. Other varieties of apples have been obtained from time to time and many Russian and native plums and other hardy fruits have been added. Some of these trees have been grown at the College, others were sent to different points in Aroostook county and still others to Rangeley. A few of them have fruited and may receive attention at the present time; a general discussion of the subject being deferred till our next Annual Report.

The following field notes represent the condition of the Russian orchard at the Station in September, 1896. This orchard was started in the spring of 1890, with one year old trees obtained from the Iowa Agricultural College.

The soil in which the orchard is located is rather heavy loam with clay sub-soil. It has a southwestern exposure. Garden crops have been grown on the land from the first and thorough cultivation has been given.

Without reference to the character of given varieties the trees are here arranged in alphabetic order. The numbers enclosed in parentheses refer to the original importation list; the other numbers, to the orchard record.

Alexander, 7—Old tree. A well known sort needing no description at this time. Belongs to the Aport family.

Aport (*252*), 39—Similar to Alexander in tree and fruit. Growth one and one-half feet. First fruited in 1895. Moderately productive. The term Aport is a generic rather than a specific one and covers a family of apples of which the Alexander is perhaps, the best known member.

Aport Ourent, 21—Upright, vigorous, spreading, with dark heavy foliage. Growth one and one-half feet. No fruit.

Arabskoe, 65 and 66—65 moderately vigorous, spreading; very productive, precocious. About one-half bushel was removed in August and the yield at harvest time was one bushel. Growth one foot. The fruit is large, heavy and covered with a rich bloom, somewhat resembling Blue Pearmain. Keeps well into the winter but is of very poor quality. 66, young tree set in 1896. Has made but a slight growth. Matures late. Growth two feet.

Arabka (257), 44—Moderately vigorous, upright, spreading. Dark in wood and foliage. Growth one and one-half feet. Fairly productive. Has a tendency to bear the fruit on the ends of long twigs like the Alexander. Same as Arabskoe.

Blushed Calville, 31—Of vigorous, upright habit, resembling Yellow Transparent. Growth one and one-half feet. It so closely resembles Yellow Transparent that its identity is questioned.

Borsdorf (356-402), 46—Vigorous, spreading, profusely branched. Branches small and slender. Light colored in wood and foliage. Growth two feet. A few specimen fruits produced in 1896. These are small, oblate, greenish yellow. Mature in late winter.

Cross Apple (15 M), 28—Very vigorous, upright, spreading. Branches freely. Limbs long and slender. Growth this year two and one-half feet. Moderately productive. Fruit resembles Haas. This variety does not correspond with the description of Cross Apple as given by various authorities and it is possible that it has been misnamed.

Daisy, 60—Two-year-old tree set in the spring of 1896, making a strong growth.

Early Sweet (No. 9 Voronesch), 8 and 52—Vigorous, upright, spreading. Large, heavy foliage. Growth one and one-half feet. No fruit.

Excelsior—One of Gideon's Seedlings. Vigorous, spreading, productive. Like the preceding and like the next one, shows the crab parentage. Wood fully matured. Growth one and one-half feet. Full crop of fruit. Fruit medium, conical, greenish-yellow washed with crimson, slightly russeted. Sharp acid. September to November.

Golden Reinette, 20—Vigorous, upright, spreading, productive, (one and one-half bushels fruit). Branches freely with tendency to form crotches. Fruit small, golden, washed and splashed with carmine. Flesh yellowish, crisp, mildly acid. A promising autumn variety. September to December. (This fruit does not correspond to Budd's description of Golden Reinette and is probably wrongly named.)

Grandmother (469), 50—Vigorous, upright, hardy. Growth two feet. But one fruit produced in 1896. Resembles Duchess. Season winter.

Green Crimean (399), 48—Vigorous, spreading and productive. Branches freely. Growth one foot. First fruited in 1896. Fruit large, smooth, conical; green, changing to yellow at maturity. A good autumn variety.

Green Sweet, 37—Wrongly named. A small sour winter fruit of no value.

Hibernal (378), 47—Of low spreading habit, moderately vigorous. Productive. Growth one foot. First fruited in 1894, (one-half bushel in 1896). Drops badly at maturity. Good for cooking. Season October and November.

Koursk Anis, 13—Set in 1895. Hardy. Moderately vigorous. Growth one foot.

Koursk Reinette, 30—Vigorous, sturdy in habit with few stout branches. Large dark foliage. Growth one and one-half feet. Productive. A promising variety. This variety we have as 20 M. The latter is by Mr. Budd, called "Sweet Longfield."

Large Anis (413 Dept.), 54—Moderately vigorous, spreading branches. First fruited in 1896 (one-fourth bushel). Growth one and one-half feet. Fruit resembles Rhode Island Greening.

Lead Apple (3 M, 277), 23 and 41—23, vigorous, spreading; branches leave the trunk nearly at right angles, so few crotches are formed. Growth one and one-half feet. Productive (one and one-half bushels in 1896). The variety which we have under the above name is apparently of the Aport family and is not the true Lead Apple as described by Budd. 41, *(277)*, very vigorous, upright, compact, few branches, has a tendency to form crotches. Growth one and one-half feet. No fruit. It is possible that when this comes into bearing we shall find that we have the true Lead Apple, although in Bulletin No. 31, Iowa Agricultural

College, Professor Budd refers to No. 277 as *Swinsovka*, a member of the Lead Apple family but not identical with 3M, the true Lead. Further study is evidently necessary.

Longfield (161), 36—Vigorous and very productive. Growth two feet. Fruit of medium size, conical, yellow with red cheek. Good for cooking and for dessert. Season September to January. In common with most of the Russian varieties, it drops badly and must be harvested early. Valuable.

Losovka (4 Orel), 1—Tree in rather a low situation, badly broken by snow and careless workmen in 1892. Recovered and making a vigorous growth at the present time. Foliage thick and leathery. Of vigorous spreading habit. Growth the present season two feet. No fruit.

Mallett, 14—Upright, compact, vigorous with few branches. Growth two and one-half feet. No fruit.

October, 81—One of Gideon's Seedlings. Moderately vigorous, spreading; few branches; very productive (one and one-half bushels in 1896). Wood well matured. Growth one foot. Fruit small, conical, yellow, washed and splashed with carmine. Flesh white, crisp, acid. A handsome fruit, good for cooking.

Orel No. 7, 3—Very vigorous, spreading. Foliage thick, heavy, resembling Losovka in this respect. Growth two feet. No fruit.

Ostrakoff (4 M), 24 and 33—24, vigorous, upright, spreading, with few stout branches and heavy dark foliage. No fruit. 33, young tree set in 1896.

Peter, 79—One of Gideon's Seedlings. Moderately vigorous, spreading; very productive. The habit of the tree as well as the character of the fruit shows the crab parentage. Wood well matured. Growth one foot. Bore a full crop of fruit in 1895 and 1896.

Red Queen (316), 45—Upright, sturdy, compact, with few branches. Bore a few specimen fruits in 1896. These were conical, greenish-yellow with blush cheek. Season winter. It is questionable whether this is rightly named.

Repka Aport (261), 40—Resembles Alexander. Produced a full crop of fruit which checked the growth to a certain extent. Growth one foot.

Repka, 5—Young tree set in 1896. Growth six inches.

Russian Gravenstein, 35—Very vigorous and spreading. Productive. A promising autumn fruit of about the season of Duchess, which it somewhat resembles.

Sandy Glass, 32—Upright, sturdy with handsome dark foliage. Growth one foot. A second growth started late in the season. But two fruits were produced.

Saunkernaty, 18—Very vigorous, spreading, branches numerous. Foliage small, but thick and with a heavy pubescence. Fruited for the first time in 1896 (one-half bushel). Fruit small, green, of fair quality. Season winter. May be of value in the north.

Silken Leaf (75 M), 34—Vigorous, spreading, dark in wood and foliage. Moderately productive. Growth two feet. Fruit small, conical, greenish-yellow overlaid with red.

Sklanka, 16—Very vigorous, upright, hardy. Growth two feet. No fruit.

Skruischapfel, 17—Very vigorous, upright and compact. Branches few and stout. Hardy and productive. Three pecks of fruit this year. Fruit small, of poor quality and drops badly.

Striped Winter, 11—Moderately vigorous, spreading. Light colored in wood and foliage. Growth one and one-half feet. No fruit. Inclined to make a second growth in autumn.

Sweet Pippin (5 Orel), 2—An upright, vigorous grower. Foliage smaller and thinner than the preceding. Average growth two feet. No fruit.

Swinsovka, 4—Moderately vigorous, upright, spreading; broad thick leaves of moderate size. Growth one foot. No fruit.

Table Apple, 19—Very vigorous, spreading, branches freely. Foliage thick, leathery, and densely pubescent on under side, of characteristic dark bluish-green color. Growth two feet. Single specimen of fruit produced in 1896. Small, roundish, oblate, green, stalk short, slender in narrow cavity. Calyx small enclosed in a broad shallow basin.

Tiesenhausen, 38—Upright, sturdy, vigorous, productive. Growth two feet. Fruit small and worthless for New England.

Tetofsky, 75 and 76—75, young tree set in 1895. Vigorous, upright, compact. Few stout branches. Very large leathery foliage. 76, the identity of this tree is doubted. We shall give description later.

Titovka, 69—Very vigorous, upright; has a tendency to form crotches. Few but stout branches. Growth two feet. No fruit.

Titus, 10—Very vigorous, spreading, shoots stout and dark colored. Foliage large, thick and leathery, with heavy pubescence on the under side. Growth one foot. First fruited in 1896 when two specimens were produced. Fruit very large and showy, but coarse grained.

Ukraine (*290*), 42—Upright, vigorous, compact, hardy and productive. Growth one and one-half feet. The fruit is large and handsome. Season September. Good for cooking.

Vargulek (*12 M*), 26—In habit of growth like the preceding. Inclined to form crotches. Rather slender for the heavy load of fruit (one and one-half bushels in 1896), which checked the growth somewhat. Growth one foot. Fruit small to medium, greenish-yellow with stripes and splashes of crimson. Quality good. Drops badly.

38 Voronesch, 53—Moderately vigorous, upright, spreading. Few branches. Growth one foot. Very productive. Fruit of Duchess type, but two weeks earlier.

50 Voronesch, 54—Vigorous, upright, compact. Branches long, but stout. Growth one and one-half feet. No fruit.

Wealthy, 68—Low, vigorous habit. Very productive (two bushels fruit in 1896). In spite of heavy crop made a growth of one foot. This is the best of the seedlings sent out by Peter M. Gideon of Minnesota.

10 M, 25—Very vigorous, upright, compact, with comparatively few but stout branches. Growth one and one-half feet. Very productive, but the fruit drops badly. Season September. Fruit small, conical, greenish-yellow with splashes of red; of poor quality.

13 M, 27—Vigorous, upright, compact, with dark heavy foliage. Growth one and one-half feet. No fruit.

18 M, 29—Upright, spreading with numerous long slender branches. Growth one and one-half feet. No fruit.

984, 51—Moderately vigorous; spreading, few branches. Growth one and one-half feet. No fruit.

387, 12—Moderately vigorous, spreading. Removed to present location in 1892. Growth one and one-half feet. No fruit.

Of the varieties above mentioned the following are at present regarded as most promising: Aport, Arabskoe, Golden Reinette, Hibernal, Lead Apple, Longfield, Russian Gravenstein, Vargulek.

The Gideon Seedlings, Excelsior, October and Peter are very productive and good for cooking but are not specially valuable save in the colder parts of the State.

IV. ORCHARD WORK IN AROOSTOOK COUNTY.

In the spring of 1890 fifty varieties of Russian apples were sent to E. W. Merritt, Houlton, and a duplicate lot to J. W. Dudley, Mapleton. The lot sent to Mapleton was divided, one-half being placed with Edward Tarr. All of the trees sent to Mapleton were placed in nursery rows till they should fruit.

Trees placed with E. W. Merritt—Mr. Merritt set his trees in a young orchard, and has given them good care up to the present time. Some of the varieties have fruited abundantly and proved of considerable value. The following table gives Mr. Merritt's observations concerning such of these trees as have fruited.

MR. MERRITT'S NOTES ON RUSSIAN APPLES.

VARIETY.	When set.	Habit of growth.	Average yearly growth in feet.	First bore fruit.	Present condition.	Productiveness	Quality.*	Season.
Anisim	1890	Very vigorous	1	1896	Good	7	1st,	L. W.
Anthony	1891	Good	1	1896	Good	9	1st,	L. W.
Aport	1890	Very vigorous	½	1896	Good	4	3d,	E. W.
Aport Seedling	1890	Poor	½	1896	Good	5	3d,	E. W.
Aport Virent	1890	....	½	1896	Good	4	2d,	E. W.
Arabskoe	1890	Upright	1	1895	Good	9	1st,	L. W.
Blackwood	1888	Vigorous, upright	1	1895	Good	5	2d,	Fall.
Golden Reinette ...	1890	....	1	1896	Good	8	1st,	L. W.
Golden White	1888	Medium, upright	1	1895	Good	5	3d,	L. F.
Hibernal	1890	Vigorous	1½	1895	Good	6	3d,	L. W.
Koursk	1890	Good	1	1896	Good	6	2d,	L. W.
Koursk Reinette ...	1890	Vigorous	¾	1895	Good	8	1st,	E. W.
Lead	1890	Good.	1	1896	Good	6	1st,	L. W.
Longfield	1890	Good	1	1895	Good	10	1st,	L. W.
No. 5 Orel	1890	Vigorous	¾	1896	Good	8	1st,	L. W.
Ostrakoff	1890	Very vigorous	1	1896	Good	7	1st,	W.
Silken	1890	Good	1	1895	Good	7	3d,	E. W.
Switzer	1888	Vigorous, spreading	1	1895	Very Good	7	2d,	Fall.
Titovka	1888	Very vigorous, upright ...	2	1894	Very Good	9	1st,	Fall.
Vargulek	1890	Good	1	1896	Good	5	3d,	E. W.

* Quality in this table is but relative. Those ranked as first quality are but second when compared with standard sorts. Abbreviations: F—fall; W—winter; E—early; L—late.

Concerning the above list Mr. Merritt writes: "I do not consider any worth propagating unless the tree ranks seven in productiveness and the fruit one in quality. The quantity is indicated more particularly with reference to use for dessert purposes. The trees mentioned in the table are all hardy, and good growers, but some of the trees sent have not come into bearing and are poor growers. Some seemed determined not to grow and have been replaced with trees of approved varieties."

Trees Placed With J. W. Dudley—Many of the varieties sent to Mapleton have already been described in the notes on the Experiment Station orchard. The two lots, however, are not quite comparable, since the trees at the Experiment Station have received more thorough culture and are not crowded into nursery rows. Because of the more vigorous growth of the former, fruiting has in some cases been delayed.

The following notes represent the present status of the trees entrusted to Mr. Dudley:

Aport (252)—Vigorous, upright, spreading. In habit of growth and in fruit resembles the Alexander. First fruited in 1896 (a few specimens). As before remarked, the term Aport applies to a family of apples which includes the Alexander and some other varieties.

Aport Ourent.—There is some doubt as to the identity of this variety. The tree is very vigorous and productive. Fruit large, handsome and promising and will receive further attention.

Arabka, (No. 257)—Broken over by snow several times. At present about the size of a good two-year-old tree and now vigorous.

Arabskoe—Hardy, healthy, vigorous. First fruited in 1896 (one half bushel). Worthy of propagation.

Bogdanoff—Tree upright with thick leathery foliage. First fruited in 1896. Fruit large, smooth and highly colored. Good. Season winter.

Borsdorf, (356)—Upright, vigorous, spreading. First fruited in 1896 (a few specimens).

Cross Apple, (No. 413)—Moderately vigorous, light colored in bark and foliage. First fruited in 1896 (one-fourth bushel).

Golden Reinette—Moderately vigorous and spreading. First fruited in 1895 (one-fourth bushel). The fruit is much smaller than on the tree in the Station orchard.

Grandmother, (No. 469)—Badly injured by the snow in 1891. Recovered and though a small tree, bore some fruit in 1896. Resembles Vargulek.

Green Crimean, (No. 399)—Injured by snow in 1891, but recovered and is now making a moderately vigorous growth.

Limbs have a characteristic horizontal growth. Its habits do not correspond with the habits of the Green Crimean as described by Professor Budd.

Green Sweet—Injured by snow in 1891. Now making a vigorous spreading growth. Has not yet fruited.

Lead Apple, (No. 277)—Vigorous, upright, with few stout branches. Twelve to fifteen inches growth. Has not fruited.

Losovka, (No. 4, Orel)—Vigorous, spreading, with thick leathery foliage. Blossomed in 1896, but no fruit matured.

Red Queen, (No. 316)—Injured by snow in 1891 and 1892. Now making a very vigorous growth. Resembles Tetofsky in habit.

Repka Aport, (No. 261)—This variety was evidently killed and a sprout from the stalk has been allowed to grow.

Rolfe—This variety, seven years from the bud, bore one-half bushel the present season and has proved vigorous and hardy from the first. It is in a somewhat protected situation, but promises well for Aroostook county.

Silken Leaf (75 M)—Vigorous, spreading. Fruited in 1895 and also in 1896. Promising.

Titus—Very vigorous, spreading, with few stout branches and large leathery leaves. Blossomed in 1896 but matured no fruit.

Vargulek, (12 M)—Broken by snow in 1891. Now making a moderately vigorous, upright growth. First fruited in 1895. The fruit is small, rather showy, but very acid and is not of special value.

38, *Voronesch*—Vigorous, upright, spreading, with thick foliage. Fruited in 1895 and also in 1896. Resembles Duchess, but two or three weeks earlier.

50, *Voronesch*—Moderately vigorous, spreading, with long willowy shoots. First fruited in 1896 (one-half dozen specimens).

20 M—A vigorous, upright tree. Bore fruit somewhat similar to Duchess. Evidently wrongly named.

No. 378—Vigorous, upright. Injured by snow in 1891 and 1892 and has never fruited.

Trees Placed With Edward Tarr—The most promising varieties in Mr. Tarr's collection are the following:

Early Sweet—Vigorous, upright, spreading. First fruited in 1896 (one-half bushel). Fruit of medium size, yellow, juicy, sweet. Valuable for the north.

Revel Borsdorfer—Very vigorous, spreading, hardy, productive. Resembles King in habit of growth. Fruit large, conical, yellowish-white, washed and splashed with carmine. Flesh crisp, agreeably acid. Good. Season late autumn and early winter. Very promising.

Royal Table—Very vigorous, upright, spreading, productive. First fruited in 1894. One and one-half bushels in 1896.

Russian Gravenstein—Very vigorous, upright, spreading, with heavy dark foliage. Fruit medium, conical, ribbed, yellow splashed with red, calyx large, closed, in a shallow, irregular basin. Stem one and one-half inches, stout and rather deep cavity. Flesh rather coarse, white, crisp, tender, juicy, brisk sub-acid. Good. Season September. As grown in Aroostook county this variety is some two weeks later than at the Station and the fruit is smaller.

Striped Winter—Vigorous, upright, spreading. Branches sparingly. First fruited in 1894; one-half bushel in 1896.

Other varieties in Mr. Tarr's collection which are of more or less value are: Anis, Antonovka and Mallett.

Orchard Work at Perham.—As stated in a former report* arrangements were made in 1891 by which a large number of varieties of fruits have been sent to the farm of Mr. James Nutting, Perham, Aroostook county. Mr. Nutting died in 1893, but the work has been continued, under the supervision of the writer, by Mr. Oliver Y. Nutting, to whom much credit is due.

The cions set in bearing trees in 1891 made a vigorous growth and most of them have borne some fruit. The close planting and rank growth of the Duchess trees used as stocks have, however, seriously affected the size and quality of the fruit. Aside from the question of hardiness, therefore, the value of many of the different varieties can not as yet be stated.

In 1892 cions of sixteen varieties were crown, grafted on Duchess seedling stocks. Others were added the following year. In 1895 all that were of sufficient size (13 varieties) were

* Report Maine Experiment Station 1891, p. 97.

planted in the orchard and the past season several more were set. At present the young trees are growing finely. The varieties included in the list are the following:

Arthur,	Okobena,
Bethel of Vermont,	Ostrakoff,
Duchess Seedling No. 8,	Patten's Greening,
Korsk Anis,	Prolific Sweeting,
Longfield,	Shiawassee Beauty,
McMahon,	Titus.
North Star,	

Besides the apples above mentioned there are on trial at present several varieties of plums and cherries, all of which are proving hardy and many of which promise to be of value. The list of plums includes the following Russian sorts: Bessarabian, Early Red, Hungarian Prune, Moldavaka, Voronesch Yellow, White Nicholas, 19 and 20 Orel. In addition to these are Cheney, Rollingstone, Wolf, and Wyant of the Americana class.

The cherries include Griotte du Nord, Orel Sweet and 23 Orel. Mr. Nutting reports as follows on these fruits:

"None of the plums sent by you have produced fruit in such abundance as Mooers' Arctic, but they are not yet as old as the latter.

"The cherries are growing well and all but one bore some fruit last year. Orel Sweet and Griotte du Nord are very promising."

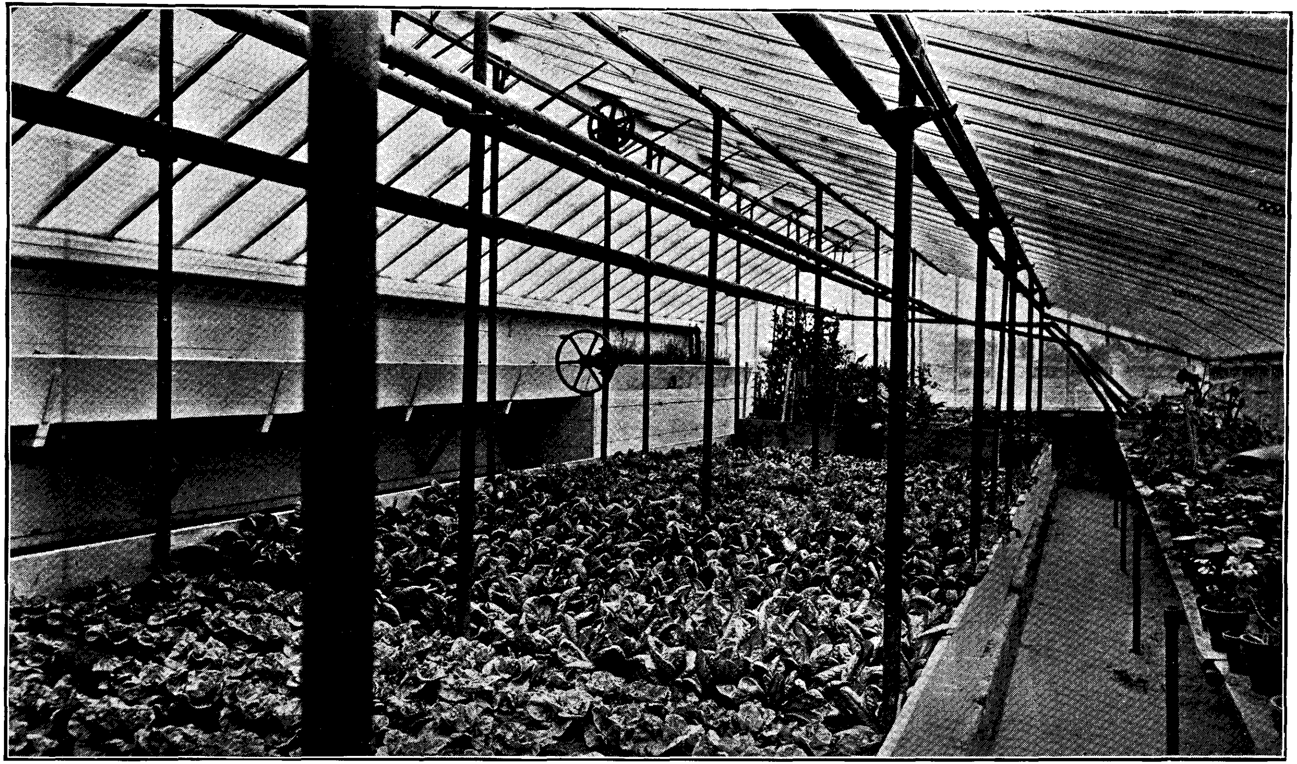
NOTES ON WINTER GARDENING.

W. M. Munson.

Eternal vigilance and the exercise of good judgment, both in the management of the crops and in marketing, are far more important than adherence to set rules in conducting successful gardening operations in winter. The grower must possess a love for the business, and must give personal attention to all of the details. All instructions must be regarded as suggestive rather than as rules to be rigorously applied. These considerations being recognized, and the requisite energy being thrown into the work, the business may be very profitable in many localities.

The risks in forcing vegetables are great. For this reason it is advisable to begin in a small way and develop with the business. One must learn how to ventilate, to water, to manage his furnace, and to market. This experimental work is best done, at first, on a small scale. Again, it will in general be necessary to create a special market for winter-forced vegetables and this must be gradually accomplished. In Maine we cannot hope to compete with the growers of Massachusetts in supplying the large wholesale markets, but must depend upon our own larger cities and towns for a market. For this reason a "fancy" market near at hand should be sought.

Aside from the cost of constructing glass houses, the most important items of expense to be considered are the fuel and the labor. The cost of these items can be only approximately estimated, since they will vary with local conditions. A single house standing alone, covering 2,000 square feet of surface, will require not far from twenty-five tons of coal for the year, if a temperature suitable for tomatoes and cucumbers is to be maintained. For lettuce and radishes considerably less is needed. Several houses standing together will require propor-



LETTUCE IN GREEN HOUSE.

tionately less fuel. In the Station forcing houses, covering approximately 4,500 square feet of glass and an office building, about sixty tons per year are used.

One good man with occasional help should be able to do all the work in houses covering 4,000 square feet of ground if the arrangements are convenient.

I. THE HOUSES USED FOR WINTER GARDENING.

1. *Cold Frames.*

The simplest form of glass structure in common use is the ordinary cold frame. This consists of a box of greater or less extent covered with a sash or sashes. The ordinary sash used in gardening work is 3x6 feet. The cold frame used in commercial operations is made by simply placing boards on edge about six feet apart and laying the sash across them, the ordinary soil of the garden being used. The boards are held in place by driving stakes inside and out and by occasional cross pieces. It is well that one side should be about three or four inches higher than the other in order that the rays of the sun light may be received a little more directly and that the water in case of rain shall run off more freely. For amateur gardens a little more care is usually exercised. A frame twelve to fifteen feet or more in length is made, the back side being twelve inches, the front side nine inches high, with pieces of 2x4 in the corners to hold the boxes together. Sashes are then put across as before indicated. In this way the heat of the sun is utilized in warming up the soil earlier in the spring, and plants may be started several weeks earlier than would be possible in the open ground. Aside from its use in starting early plants the cold frame is little used in "winter gardening."

2. *Hot Beds.*

The hot bed is similar to a cold frame with the addition of some artificial means of raising the temperature of the soil. The usual means employed is that of fermenting manure. In preparing a hot bed, it is well to dig a pit about two feet deep and if a permanent bed is desired, this may be either planked up or bricked up to keep out mice. The hot bed is not practicable for use in midwinter, but may be made as early as March for the starting of early tomatoes, cabbage plants, etc.

In starting a hot bed, fresh, rather strawy manure is used. Horse manure is preferable for this purpose, but sheep manure is sometimes used; that from highly fed animals is best. The manure should be placed in large piles as taken from the stable and turned occasionally to prevent overheating. When the bed is started a layer of manure about six inches deep is placed at the bottom and thoroughly tramped. Then another layer is put in in the same way and so on successively until the pit is full. In case there is not much straw or litter in the manure, alternate layers of leaves may be used to good advantage. This will prevent too rapid fermentation and will make the bed last much longer.

When the pit is filled, a frame similar to the one already described is placed over it and from four to six inches of rich soil are added. The pit for the manure is made about six inches wider than the frame in order that the soil may be heated evenly clear to the edges of the boxes.

In the management of hot beds and cold frames great care is necessary or damage will result from fluctuations in temperature. The volume of air is so small that the atmosphere is quickly affected by outside conditions.

After making the frame a thermometer should be placed within the frame and no seed should be sown until the temperature of the soil has receded to about 80°. In sunny weather constant care is necessary to prevent the burning of the plants. An hour's neglect will sometimes ruin a season's work. It is a good plan to have shades of light cloth to put upon the beds in April and May to avoid this danger. These are best made by tacking pieces of light cotton cloth, which has been soaked in linseed oil, upon wooden frames the same size as the sash. Heavy straw mats are also necessary to protect the beds from cold at night.

Sometimes instead of the single frames described, hot beds are made double, the center being somewhat higher than the sides. In this case, bottom heat is often supplied by means of a flue or hot water pipes instead of fermenting manure. In general, however, for commercial purposes a cheap forcing house is to be preferred to the "fire hot bed," as such a house may be put up at but little greater expense and the cost of maintaining is but little more, whereas the work may be done much more easily and satisfactorily than is possible with the hot bed. In short, a forcing house may be described as a hot bed large enough to get inside of.

3. *The Forcing House.*

a. *The Lean-to:*—The lean-to or shed-roof house is a natural development of the cold frame or hot bed, and temporary houses may very easily be made by placing ordinary hot bed sash by the side of a wall. This form has the advantage of cheapness in that the sides of a building may be utilized, but it has the disadvantage of allowing light to come in from only one side. A lean-to house should naturally be placed upon the south side of the wall or building.

b. *The Uneven-Span House:*—The form in most common use at the present time is the so called two-thirds or three-fourths span house. It is similar to a lean-to excepting that the peak has been cut off, thus doing away with a large amount of waste space and allowing more light to come in. In general, houses of this description are placed east and west with the long slope to the south. Recently there has been some discussion concerning the merits of the practice of placing the short slope to the south. The advantages claimed for this practice being that the rays of the sun are much more directly received by the sharper angle; that the snow slides off more quickly; and a third doubtful advantage claimed is that on the north side the long slope will retain the snow to a certain extent and thus shut out cold drafts. The uneven span house is the form almost universally used for the growing of roses and for most commercial purposes. Figure 1 represents such a house at the Experiment Station, which is used for growing lettuce.

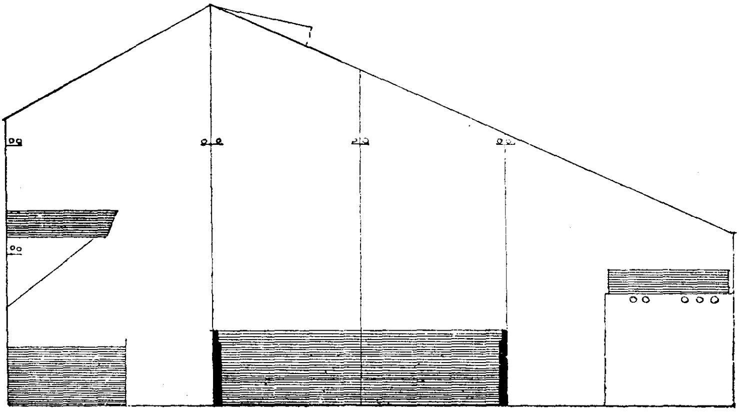


FIG. 1. UNEVEN-SPAN HOUSE.

In making an uneven-span house the angle of the long span with the horizontal is about thirty to thirty-five degrees; that of the short side thirty-five to forty-five, sometimes more.

c. The Even-Span House:—This form, figure 2, is used mainly for narrow propagating houses and for conservatories rather than for commercial forcing houses. It is seldom used in a house more than sixteen feet in width. Even-span houses should be placed with the ridge running north and south. They have the advantage of admitting the sunlight on all sides of the plants.

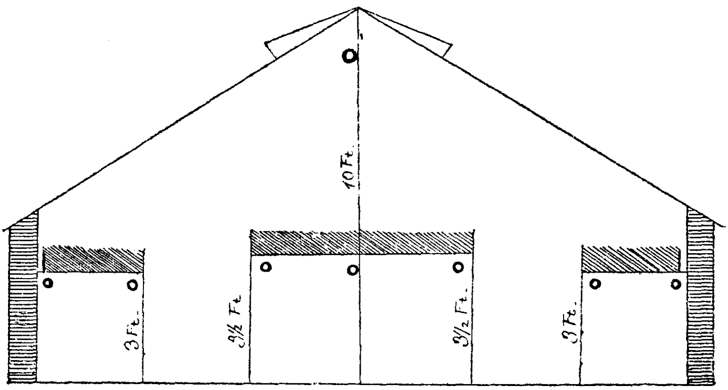


FIG. 2. EVEN-SPAN HOUSE.

4. *Construction of Houses.*

a. Walls and Foundations.—From the nature of the superstructure it is evident that while the foundation of the forcing house need not be specially heavy it must be very rigid. There must be no displacement from lateral pressure nor must there be a possibility of heaving from the action of the frost. If practicable a foundation of cement or stone is desirable, but ordinarily commercial houses are built without such foundation.

The best green house wall is that which at the least expense is perfectly rigid, is durable and will effectually shut out drafts of cold air. A cheap and effective wall is readily made by the use of posts and matched boards. In building such a wall as this, posts are set about four feet apart and in this climate at least four feet deep, that there may be no danger of heaving. The posts should be as uniform in size as possible, about five or six inches being large enough. It is well to place a flat stone in the bottom of the hole before setting the post. A sheet of tarred paper is then tacked on each side of the posts and outside of this the sheathing is placed. Along the top of the posts should be placed a two-inch strip equal in width to the thickness of the posts, and above this the plate. The plate should be about 3x9 inches and bevelled on the top so that moisture may run off readily. It should be grooved on the under side to receive the matched boarding and thus shut off all possibility of the entrance of cold air. It should also have another groove nearer the edge to prevent the backing up of water into the joint formed with the boards. When completed the plate will then project one inch beyond the wall as shown in figure 3.

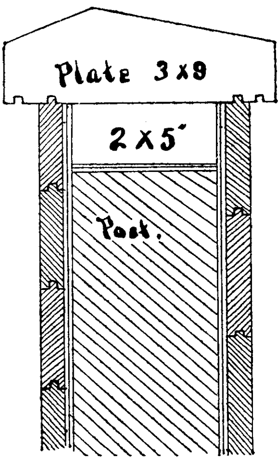


FIG. 3. A CHEAP WALL.

A wall of this description may be built very cheaply and under ordinary conditions will last ten to fifteen years. The posts should of course be selected with care and cedar or locust should be used.

Brick and tile are sometimes used for green house walls. There is always danger, however, that because of excessive moisture and frequent changes in temperature such a wall will not prove durable. The brick wall which appeals to me most strongly is one used by Professor Green of Minnesota.* This consists of a four-inch brick wall on each side of a three-inch hollow tile with a one-inch air space on each side of the tile—thus making a thirteen-inch wall. In this wall we have three separate dead-air spaces, an arrangement from which we should expect excellent results. Such walls, are, however, very expensive and not advised for ordinary commercial purposes.

Some of the houses at the Experiment Station have been built with a double brick wall with an intervening air-space of about two inches. This arrangement is fairly satisfactory provided the brick used are well burned. In any case it is important that the two courses be tied together at frequent intervals.

b. Roofs:—As already indicated, the simplest form of green house roof is made by the use of ordinary hot bed sash. This form has been modified to a certain extent in the building of orchard houses and other like structures with temporary roofs. In such cases a permanent wooden or iron frame is constructed and sash are put in place whenever the houses are desired for use. At the present time, however, some form of permanent sash bar is considered preferable. Sometimes rafters of 2x4 stuff are placed about six or seven feet apart to give rigidity to the roof, but the tendency at the present time is to use rather heavy sash bars and omit the rafters. In this climate, because of the excessive falls of snow to which we are liable, sash bars about 2x2 1-2 inches should be used. Purlins should also be placed at frequent intervals. All supports may best be made of gas pipe or small steam pipe rather than of wood. The object in all of the details of construction should be to shut out as little light as possible. The gas pipe purlins may be made to serve the double purpose of supporting the roof and of carrying the water where desired. This method is followed in some of the larger commercial establishments. It has been

* Bulletin 7, Minnesota Experiment Station

suggested that these purlins be utilized in conducting steam for heating, but the advisability of such a practice is questionable because of the alternate contraction and expansion which would follow and the consequent disturbance of the glass. Each sash bar is held in place by means of an iron strap.

A ridge pole of 2x5 stuff is generally used. This should be grooved at the sides to receive the glass, as shown in the figure.

c. Glass:—In general it is better to get second quality double thick glass of pretty good size. We prefer 14x22 or 16x24 although because of the lower price on smaller sizes it is common among florists to use 12x15, this being the largest size at the low prices. Belgian glass is more expensive than the American product but is superior to the latter. In some sections heavy plate glass is employed. Of course this latter is very expensive, but it is very durable.

There is a common notion that a flaw or bubble in the glass is likely to serve as a lens and result in burning foliage. Such, however, is not the case as was shown by some very careful work conducted by Mr. J. C. Blair at Cornell University during the past year; but glass of a wavy character or of uneven thickness should be discarded. It is glass of this character that causes the trouble.

5. *Ventilating and Ventilating Machines.*

In general, ample provision should be made for ventilation. The object of ventilation is to purify the atmosphere rather than to lower the temperature and provision should be made whereby the outside air may be admitted near the base of the house as well as at the ridge. The ventilators should extend the whole length of the house, rather than be confined to a few small sashes. It is better to raise the whole line a little than to raise a few sashes to a greater extent, as in the latter case there is danger of injury from cold drafts. Many growers prefer that the ventilators should spring from the ridge, as in this way the warmest air will escape and it is claimed that the house may be kept cooler in very hot weather. In our own experience, however, we prefer to have two lines of ventilators operated independently. In this way, provided the ventilators are hinged at the ridge, we may avoid direct drafts in case of high winds. The ventilating sash should, if possible, be from two to three feet wide and should be continuous for the whole length of the house.

There are several styles of ventilating apparatus, among the more prominent of which are the Hippard, manufactured by E. Hippard of Youngstown, Ohio; and the Challenge, manufactured by the Quaker City Machine Company, Richmond, Ind. The latter has been, perhaps, one of the most satisfactory with us. Another style which we have in our houses is the so called automatic cable ventilator manufactured by A. Q. Wolf & Bro., Dayton, Ohio. This style has the merit of cheapness and thus far has been very satisfactory with us. We have had it in operation for three years. The Rochefort apparatus, now on sale by Henry A. Dreer, Philadelphia, is an English machine which acts on the same principle as that made by Wolf Bros. This has been used but very little in this country. The automatic ventilator, manufactured by the Chadbourne-Kennedy Company, of Poughkeepsie, N. Y., is an expensive machine, costing $50, but with us has proved very satisfactory. An extended discussion need not be given in this connection because it is not likely to be of general use among commercial gardeners. In the extensive houses of W. K. Harris, Philadelphia, the machine is, however, exclusively employed and is regarded very highly.

6. *Methods of Heating.*

Whatever method of heating is used it is well first to consider the cost, the efficiency, the durability and the economy both of fuel and attendance. The method of conveying smoke and other products of combustion through the house by means of brick or tile flues has in the main been superseded by the modern methods of steam and hot water heating. The first cost of flues is certainly light and the fact that they are still used by florists in many parts of the country is sufficient proof of their efficiency, but they are not economical and there is always danger of leakage and the escape of coal gas which is very destructive to plant life. In the large lettuce houses which supply the Chicago markets, however, this method of heating is still very commonly used.

In modern green house heating we have only to consider two general systems—steam and hot water in closed circuits. Each system has its ardent champions; each has its advantages and its faults. Both claim economy of fuel and ease of control as specially strong points. It is claimed that the hot water heaters require less attention than steam heaters. This, however, is a doubtful advantage save at night as frequent attention to the fires is essential to the most economical use of fuel. On the other hand, fewer boilers are required to heat a large plant if steam be used and the first cost of piping for steam is very much less than for hot water. There is no doubt that in the economy of construction and in efficiency, when the circuit is very crooked, steam has the advantage. On the other hand, there is less fluctuation in temperature with hot water.

In selecting a hot water heater, observe the amount and arrangement of direct heating surface, the arrangement of water sections in the heater, the ease of cleaning and the readiness with which leaks may be mended. Horizontal sections are usually most efficient.

For steam heating an ordinary second-hand horizontal flue boiler, condemned for high pressure work, will be found cheap and satisfactory.

7. *Pipes and Piping.*

The common practice both with steam and hot water at present is to carry the "riser" or flow pipe to the farther end of the house and there distribute heat by means of smaller return pipes. If practicable there should be a gradual ascent in the flow pipe from the furnace to the point of distribution in the returns. There should then be a gradual descent of the return pipes to the furnace. The size of pipe best suited for returns depends upon the length of the coils and also to a certain extent upon their height above the heater. In general, two inch pipe is to be preferred if hot water is used and one inch or one and one-quarter inch with steam. We sometimes use one and one-half inch pipe for hot water circuits, but unless the coils are very short the friction reduces the efficiency of the apparatus.

There has been much discussion as to the relative merits of placing the pipes overhead in the house or under benches. In general, we have found that a combination of the two systems is preferable.

8. *Internal Arrangements and General Management.*

a. Beds and Benches.—There is a great difference in opinion, as well as in practice, concerning the use of shallow benches or of solid beds in forcing houses. In the great lettuce houses of Arlington, Mass., the solid bed is exclusively used, while the famous Grand Rapids lettuce of Michigan is grown entirely upon shallow beds in flue heated houses. In general, however, we would advocate solid beds for plants requiring no bottom heat, such as cauliflower, lettuce, radishes, etc.; while for semi-tropical plants like melons, cucumbers, beans and tomatoes, benches are preferable. Built as they usually are of waste lumber, benches are short lived and must be renewed in from three to five years, but with a little extra care and attention their durability may be doubled. If wooden legs are used, raise them above the level of the soil and place a stone or brick under them. A better plan, however, is to use old steam pipe for legs and allow the pipe to extend to the top of the front boards, thus holding the latter firmly in place.

Another important consideration in making benches in the green house is that a space be left next to the wall that the hot air from beneath may circulate freely next to the glass and that the plants be not injured by cold drip from the roof. If the supports be of wood, it is specially important that paint be used very freely. In all benches provision should be made for drainage by leaving cracks between the bottom boards. Instead of boards, slate or tile is sometimes used. The latter is preferable, but either of these is of course much more durable than wood and is a better conductor of heat. For ordinary purposes, however, wood will probably continue to be mainly used.

b. The Soil:—The soil for use under glass should, as a rule, be more sandy than that usually called "good garden loam." The reason for this is evident. We know that, other things being equal, plants make a more rapid growth and mature more quickly on warm sandy soils than on heavy loams, and it is just this quick growth that we must have in the forcing house. The atmosphere is quiet and is so moist that evaporation is reduced to a minimum in the house, and heavier soils are very liable to become sour or in bright sunny weather to lose their water quickly and become hard and "dead."

A good general rule for forcing house soils is to use two parts of sand, two parts of well rotted manure and two parts of loam from the garden or of turf from an old pasture. Freshly prepared soils will never give satisfactory results in the house. For this reason a large quantity of prepared soil should be kept on hand in a convenient place. Rotted sod is the best basis for green house soils. Our own practice is to get a quantity of sods from an old pasture and place these in layers, grass side down, in a regular stack. Alternating with layers of sod may be placed a liberal quantity of stable manure. The top of the heap should be flat or somewhat concave to retain the rain and hasten decay. Decay may also be hastened by a liberal use of lime while the stack is being made. The heap should be thoroughly forked over after a few months and again at the time of removing to the house. At the second handling any desired amount of sand may be added.

c. The Water:—An abundant and unfailing water supply is essential. Where it is possible to use city water, this will be the best source of supply. Otherwise cisterns must be built or wells provided at considerable immediate expense. Rain water or river water is to be preferred if obtainable, but this is not imperative.

When and how to supply the water is far more important than the source of supply, provided there is no injurious element present. The operation of watering is perhaps the most important factor of green house management. The older a gardener grows the more care he takes in watering, for carelessness in this operation is the exciting cause of innumerable diseases of plants. It is the last operation an apprentice is taught and probably not one man in twenty is thoroughly competent in this direction. In all of the life processes of plants, water is an important factor; but it is well known that plants require very different amounts of water at different seasons, in different situations, or in different states of health.

In applying water we must remember that each plant has an individuality which should be taken into consideration. Transpiration (giving off water) is a physiological and not a mechanical process. It is regulated by the vital action of the plant.

The amount of water depends upon, (1) The kind of plant grown. The native home of a plant may suggest the amount of water needed. For instance, the cactus is a native of the desert and requires but little water, while the tomato is found in a moist region and requires a large amount of water. (2) The conditions as to health and disease. As above mentioned, the vital processes of diseased plants being less active, such plants will utilize less water and will be injured if kept too moist. (3) The nature of the soil. Retentive soils will, of course, require different treatment than will light sandy soils. The former, if given too much water, will very soon become heavy and water-soaked, while the latter will stand very liberal applications. (4) The atmosphere of the house. We must remember that the atmospheric conditions of the house are such that the amount of evaporation is greatly reduced. The plants, too, are thickly crowded together and the ground shaded. These facts will have an immediate bearing on the amount of water to be used at any one time. Naturally in bright sunny days much more water is used than in cloudy weather. Indeed, it is advisable to avoid watering so far as possible on cloudy days.

d. When and How to Water:—In the winter it is rarely advisable to syringe plants or to do much heavy watering in the afternoon as the temperature would be lowered too much, thus favoring the development of fungi. In the summer, on the other hand, it is often advisable to water late in the afternoon in order to reduce the temperature. In general, morning is the best time to apply water, and at this time the walks should be thoroughly wet down to keep the atmosphere moist. In any case the soil should be kept constantly moist. Plants like plenty of water to drink, but will not stand wet feet all of the time.

Whether to apply the water in the form of a spray, wetting both the plant and the surface of the soil, will depend on the kind of crop grown. Roses and other hard wood plants will stand frequent spraying, and it is well to have the surface of the soil moist in the case of melons, cucumbers, etc. Some others, however, thrive best when the surface of the soil is kept dry, so with the latter it is well to force the water to the bottom of the bed in a solid stream, while with the former the thin spray is desirable.

e. The Sunlight:—There is a marked difference in plants, even though closely related, in their ability to stand sunlight. The melon, for instance, will thrive in the strongest sunlight, while the cucumber, which is closely related, also tomatoes and lettuce do better if the roof is slightly shaded during the bright days of spring.

The ill effect of direct sunlight is shown in the "burn" of lettuce and cucumber plants after a few days of cloudy weather. The bright sunlight dries the atmosphere of the house quickly and, according to Galloway, the rapid transpiration causes the breaking down of the tissues. The amount of sunlight is controlled by the use of shades or rollers or more often by painting the roof. A lime white wash applied with a spraying pump is often recommended. This, however, is a temporary expedient as the lime soon washes off. A little salt added to the white wash will greatly increase its adhesive quality. In our own practice we generally use a thin paint of white lead and naphtha, and apply it with a brush. This wash is more durable than the other, is neater, and if not too thick, is readily removed with a cloth or scrubbing brush whenever desired.

f. Insects and Fungi:—The confined atmosphere and high temperature of the green house seem specially favorable to the development of insects and fungous enemies. One of the most common insect enemies is the aphis or green fly, so called. To meet this enemy tobacco smoke is the best weapon. The house should be thoroughly fumigated at least once a week. Trays containing moistened tobacco stems placed upon the steam pipes are sometimes used with good effect.

Snails and slugs are also troublesome. These may best be met by liberal applications of lime and by making traps by placing boards or pieces of potato around in various parts of the house and by hand picking. One of the most common fungicides is potassium sulphide (liver of sulphur) which may be obtained at any drug store. This is applied by dissolving about one-half ounce in a gallon of water and spraying the plants. It is less conspicuous on the foliage than is the Bordeaux mixture and if used in season is very effective in keeping down most fungous diseases. Whenever a plant is observed to be diseased it should at once be removed and destroyed. "Eternal vigilance is the price of success."

II. VEGETABLES GROWN IN WINTER.

In any garden work, and this is specially true of the winter garden, the secret of success is to have something on the ground constantly. It costs but little more to have some plants half grown and ready to take the place of the first crop when marketed than it does to devote the whole house to a crop and then wait several weeks for the next to come on. In case of plants not readily handled, "catch crops" may be grown in the interim.

The most important crops used in winter gardening are: Lettuce, tomatoes, cucumbers and radishes. Besides these staple crops, there are many of minor importance in themselves but which may form important factors in keeping up a succession of crops or in utilizing otherwise waste space. Among these are: Asparagus, bean, cauliflower, cress, parsley, pepper, etc.

Lettuce.

Lettuce is one of the most satisfactory crops for the beginner in greenhouse gardening. It is easily managed; requires a smaller outlay for a suitable house than is necessary for most crops; it is always in demand, and is not a total loss if not marketed within a certain limited time. The plate represents the lettuce house at the Experiment Station as seen in January. The lower bench was at this time devoted to other purposes. It is often used, however, for carrying forward young plants. From three to four months are required for lettuce to attain the best condition for marketing, though with somewhat strong bottom heat we have taken off a crop in ten weeks from the time the seed was sown. So in growing lettuce for the winter markets, the seed for the first crop should be started as early as September 1, and other sowings should be made at intervals of about two weeks to insure a constant supply.

Our own practice is to sow the seed in light, rich soil in flats—shallow boxes about 16x20 inches and two inches deep—and place the flats in a moderately warm and well ventilated room to induce rapid growth. A house kept at a night temperature of about fifty degrees is preferred. When the first true leaves are well started, the young plants are pricked out about 2x2 inches in other flats or in shallow beds. Watering is carefully attended to and the soil is stirred frequently. About a month later the plants are transferred to permanent beds, being placed about 6x6 or 8x8 inches—the distance varying with the variety grown. Many successful growers practice handling twice before the final transfer, placing the young plants two inches apart at the first handling and four inches at the second. With the second and third crops this is, doubtless, a good practice as the main body of the house is thus more fully utilized.

The soil for lettuce should be very rich, light and porous. On solid beds we also place a layer of fresh stable manure before putting in the soil; thus having, in effect, a large hot bed in the house. Before the second crop is put on the bed, the soil is enriched by a liberal quantity of well rotted stable manure.

The quality of lettuce is exceedingly variable, depending largely on the conditions of growth. A good lettuce plant is of rather a yellowish green color and the leaves are thin and brittle. To be of the best quality lettuce must be grown rapidly. The element most important in securing rapid growth of foliage is nitrogen; this element we often apply in the form of nitrate of soda. Place about three ounces—a small handful—of the nitrate of soda in a twelve quart can of water and sprinkle the soil thoroughly. In order that the nitrate be applied at the rate of 100 pounds per acre, each can of water should be distributed over a space about nine feet square (81.6 square feet).

During the earlier stages of growth the plants may be watered freely with a coarse spray; but as the heads begin to form and the leaves cover the surface of the ground, we usually water with a solid stream between the plants. Not infrequently the heading of the plants seems to be hastened by an occasional application of warm water. The marked success of the method of sub-irrigation already outlined will no doubt completely change existing methods. In any case, the atmosphere should be kept moist by frequent spraying of the walks. The leaf surface of the lettuce plant is enormous, and the rapid transpiration in case the atmosphere is very dry will often seriously injure the plants.

The temperature of the lettuce house may be varied considerably, though most growers prefer a night temperature of about forty-five degrees and a range of about twenty degrees during the day. In case it is desired to hold a crop in check for some special purpose, the house may be kept ten degrees lower than here indicated. On the other hand, we often force the crop for a short time by increasing the heat. But, in general, the conditions of temperature should be as nearly uniform as possible.

Insect and fungous enemies must be closely watched. It is a good plan to strew tobacco stems or tobacco dust on the bed among the plants; and thorough fumigation once or twice a week is indispensable. Whenever a plant is affected with mildew it should at once be removed and the use of sulphur on the steam or hot water pipes is recommended. If the soil is stirred frequently, however, and if there is reasonable care in watering and in maintaining a uniform temperature, we are seldom troubled with mildew. One of the advantages claimed for the practice of sub-irrigation is that there is less liability of trouble from disease.

The most profitable varieties to grow will depend entirely on the markets available. In New England there is very little demand for any but the cabbage lettuces, of which there is nothing better than White Seeded Tennis Ball, or a selected strain of this, known as Rawson's Hot House. Of the curled-leaf varieties, Grand Rapids is most popular. The cabbage lettuces are more difficult to grow than the others and usually command a correspondingly higher price.

In marketing, the heads are cut off at the surface of the ground and packed in barrels or crates for shipment. Many growers, however, prefer to pull the plants, carefully shaking off all dirt before packing. The demand is best and the prices are highest in February and March, at which time the heaviest crop should mature. In Boston and other eastern markets the prices range from sixty cents to $1 per dozen heads and often higher.

Profits.—Supposing the plants to be set 6x6 inches, we should have four plants per square foot. At sixty cents per dozen this would be twenty cents per square foot for each crop or say fifty cents for the season, as the net proceeds from the house,—a very favorable showing when compared with other crops.

Tomato.

The improved facilities for shipping and the increased extent of the market gardening industry in the South have to a certain extent reduced the demand for hot-house tomatoes; they often bring $1 per pound, however, and seldom in mid winter fall below forty or fifty cents in the Boston markets. In New York competition is stronger and prices are lower, but in most cases the cost of growing and marketing will not exceed thirty or thirty-five cents. Even in the face of southern competition the tomato may be profitably grown, for there is always a demand on the part of some people for the best and the very novelty of hot-house fruit will often count for as much as its unquestioned superiority.*

Cucumber.

The secret of success in growing cucumbers is to have a light, rich soil, good light, strong bottom heat and uniformly high temperature. The ideal house for cucumbers is one which is large enough to allow the vines to attain a good size without interfering with each other; which has rather a flat roof and which will allow ventilation without permitting a draft to strike the plants. A large house is preferable to a small one as the temperature is less quickly affected by outside conditions. As a means of bottom heat, steam or hot water pipes may be used; or if the plants are grown in solid beds fermenting manure is often employed. In our own practice, the plants have been grown in shallow beds heated with steam or hot water.

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* For further notes concerning the forcing of tomatoes see Annual Report Maine Experiment Station 1894, p. 55.

Any time after the first of September the tables may be prepared for the winter crop. A layer of potsherds or "clinkers" from the furnace is first spread upon the table to insure good drainage, then light, rich, fibrous soil to a depth of six or eight inches. No time spent in doing thoroughly the work of preparation is wasted.

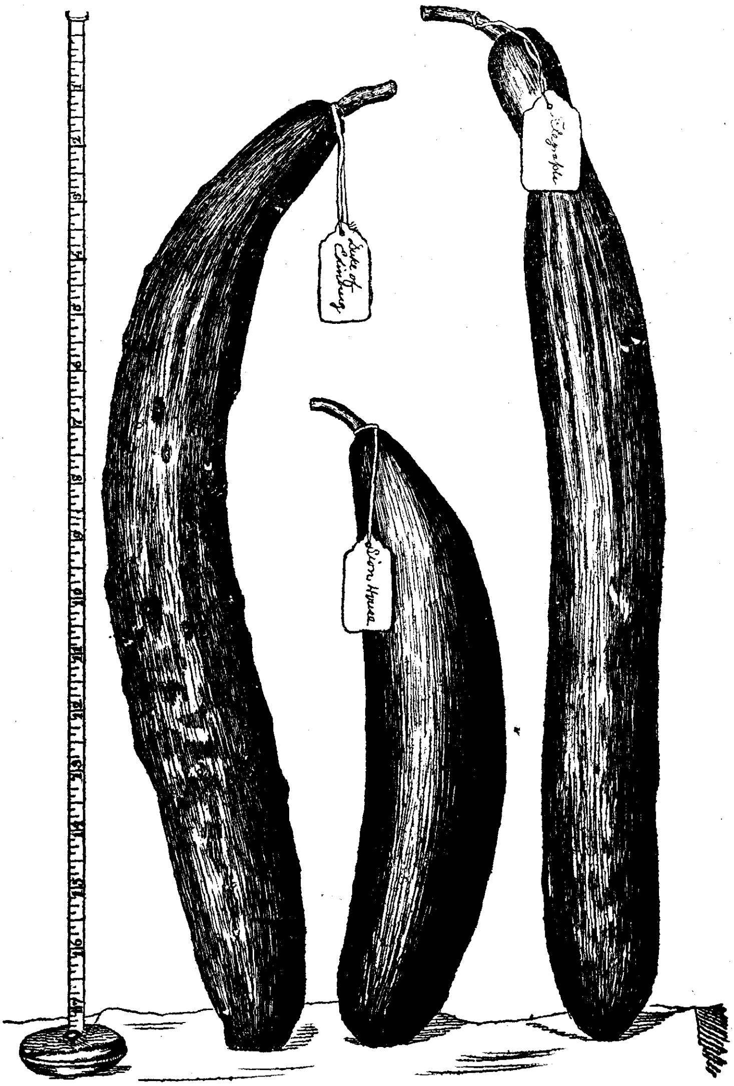


FIG. 4. TYPES OF ENGLISH CUCUMBERS.

The seeds may be sown in the soil where they are to grow or may be started in pots and afterwards transplanted. We usually prefer the latter method. In either case a catch crop may be taken from the bench before the cucumbers are large enough to interfere.

In some sections of the country the English forcing cucumbers are highly prized and it is mainly to this class that attention has been given at the Experiment Station. The cucumbers of this group are very large, varying from fifteen inches to two feet in length, and are practically seedless. The quality is of the best, but the demand for English cucumbers is limited to the fancy trade. Figure 4 represents three of the most popular varieties.

In New England the White Spine, or one of its improved forms, is almost universally grown, and the solid bed rather than the shallow bench is generally used.

As already noted the crop is started any time after the first of September, but the common practice among the larger growers is to raise two and sometimes three crops of lettuce in the house before giving up the space to cucumbers.

About December 1 cucumber seed is sown in a warm house over strong bottom heat. When well started, the young plants are transplanted once or twice to encourage root growth and by the first week in January are in five or six inch pots, and ready for planting out as soon as the lettuce is removed.

Before setting the plants, trenches about one and one-half feet deep and a foot wide are dug about ten feet apart running the full length of the house. These are partly filled with fermenting manure, which should be firmly packed as for a hot bed. The soil is then replaced in the trenches, and the plants set directly over the manure.

The plants are set three and one-half feet apart, two plants at each point for training in opposite directions. Trellises are then made, by placing A shaped supports of iron or wood between each two rows. These supports reach from the bed nearly to the glass and horizontal wires are stretched over them. In this way a V shaped space is left at each row of plants.

The atmosphere should be kept moist and very warm. The temperature should never run below sixty at night and sixty-five is preferable.

Radish.

The radish is among the most easily forced of the vegetables, but in New England markets there is only a relatively small demand for it during the winter. It is best grown as a catch crop—as in the interim between lettuce and cucumbers in spring or between crops of beans—or a single bed may be devoted to this crop in the lettuce house. (See Plate.)

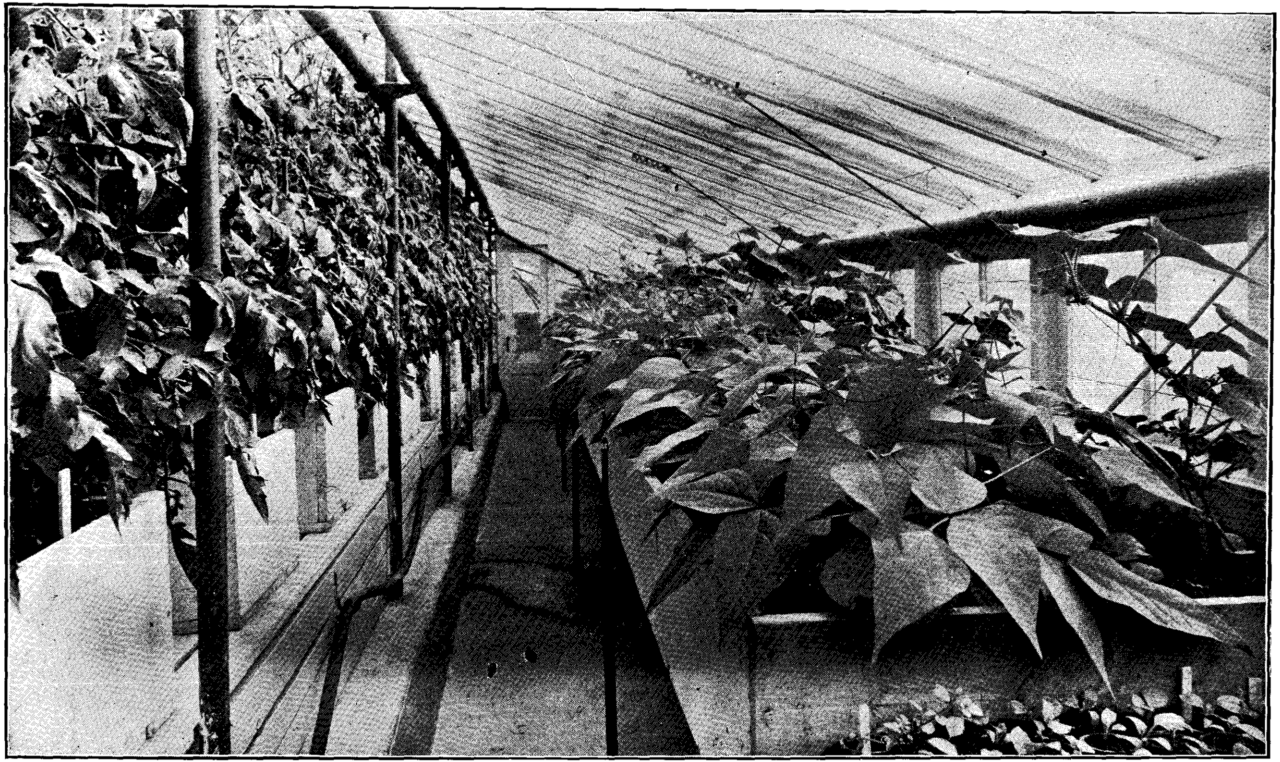
It is usually supposed that the radish demands much the same conditions as lettuce, but in our experience better results have been obtained in a much higher temperature than is suitable for lettuce. The crop must be forced into a rapid and continuous growth in order to secure the fresh, crisp roots that are desired. In rich soil and with sufficient water it is sometimes ready for market in twenty-one days from the seed.

The red turnip-rooted varieties are the ones used mainly for forcing. Of these Cardinal Globe and Non Plus Ultra are among the best. White Box is a favorite in some markets.

An important point to observe in marketing is that the radishes in any given bunch be of uniform size. The wholesale market price will range from $2 to $4 per 100 bunches. A bunch usually takes about eight to twelve roots; varying with the size.

In a general way, as pointed out by Galloway, it is found that about thirty-five per cent. of a given crop of radishes will reach marketable size in thirty-five to forty days, thirty per cent. requiring two to three weeks longer and the rest never mature. Now here is a chance for loss. If the whole crop is taken off when the first plants are mature—as is very desirable—we have no returns from about two-thirds of the ground occupied. On the other hand, if we wait for more of the plants to mature, the next crop is held back fully two weeks and in course of the season this means loss of time sufficient to grow one full crop.

A solution for this difficulty is offered by Professor Galloway of the Department of Agriculture in a very careful study of the relation of the size and weight of seeds to the growth of plants.



TOMATOES AND BEANS UNDER GLASS.

In his studies of the radish Mr. Galloway found that, "large seed germinated more quickly and certainly and produced marketable plants sooner and more uniformly than small seeds."

He further concluded:

"(1) By the use of large seed eighty-five to ninety per cent. of the crop may be brought in at the same time.

"(2) Practically all the plants thus grown being marketable no ground is wasted.

"(3) Enough time is saved by using large seed to grow one additional crop during the season. In other words, if four crops are grown, using mixed seed and waiting for plants to attain marketable size, five crops can be grown if large seed is planted.

"(4) The only additional expense is the extra amount of seed used, all the smaller ones being sifted out and thrown away."

This extra expense will average perhaps twenty-five cents per pound of seed. But as one pound will plant about 1,500 square feet of ground, the item is not of great importance.

Beans.

Beans are easily forced and in many places form one of the best secondary catch crops. They are ready for picking in six to eight weeks from the time of sowing and may well be grown on the beds devoted to melons and cucumbers, before the latter need the whole space. The same soil and general conditions described for cucumbers are well suited for the crop.

Beans may be started on the benches where they are to grow, or in pots—two or three beans in a three inch pot—and transplanted in about two weeks. Successive crops are usually started in pots.

Lack of heat in the early stages of growth may delay the crop for a month, so it is not the part of economy to delay heating the house in the fall. A night temperature of about sixty degrees is found best.

Special care is necessary in watering; the leaf surface, and consequently the transpiration of moisture, is enormous and there is danger that the soil may become dry from beneath.

8

An occasional spraying does no harm, but in general it is best to water with a solid stream and see that the soil is thoroughly wet.

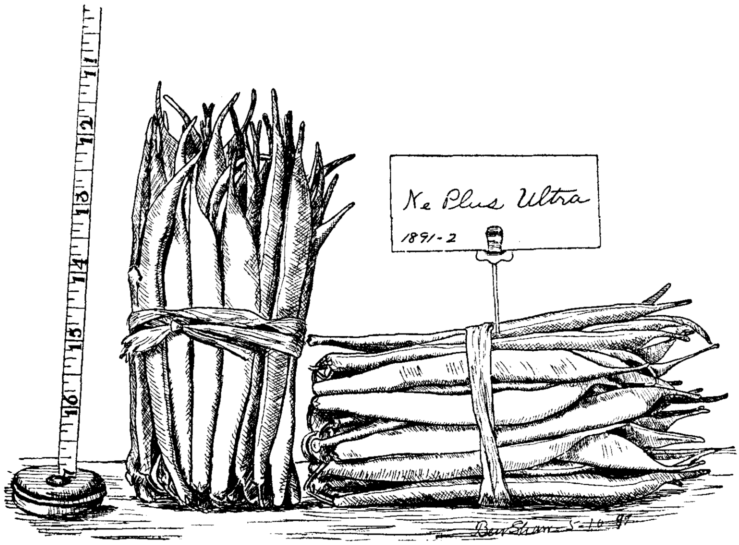


FIG. 5. BEANS READY FOR MARKET.

Growth should be continuous and rapid from the first. A little nitrate of soda, say once a week, after the blossoms appear, will not be amiss. This may be applied in water as described for lettuce.

The crop should all come off within a few days—three or four pickings—so it is important to have the succeeding crop well advanced, that little time may be lost.

The essentials of a good forcing bean are that it should be of compact habit, early maturity, and that there should be an abundance of long, straight cylindrical pods. Sion House is perhaps the best variety for forcing, though Refugee and Ne Plus Ultra have done well. Most of the wax varieties are too unsymmetrical and too susceptible to disease.

For marketing, the pods are tied in bunches of fifty, as shown in figure 5. These bunches should bring fifteen to twenty-five cents each. At this price the crop is profitable.

Asparagus.

This crop is best grown in a portable house, i. e., the roots are planted somewhat more closely than in the field and a temporary house is erected in March to hasten the crop in spring. Sometimes a permanent iron frame is erected and steam pipes are laid about the bed. Glass or canvas is then put on and heat started whenever desired. Such a house is in use at the Cornell University.

An inexpensive modification of this method is sometimes employed. Three rows of asparagus are planted in the ordinary way, the rows, however, being but two feet apart. They are given ordinary field culture till well established. Lines of boards are then set on edge along each side of the bed and hot-bed sashes are laid across, making an ordinary cold frame. The crop may thus be materially hastened, but of course will be later than if supplied with artificial heat. In summer the sashes are removed and the bed is given ordinary open air culture.

The labor and expense of forcing asparagus are light and prices are always remunerative.

Rhubarb.

This crop readily responds to heat and moisture and might well be grown more largely than at present. As usually grown, roots are taken up in the fall and stored till the crop is desired, when they are brought into a moderately warm house and placed under the benches, or in some cases are placed in a "spent" hot-bed. This is a wasteful practice as the roots can be forced but once.

The best plan is that followed in some parts of Massachusetts where a skeleton house is erected, as suggested for asparagus, and provision is made for steam heating. The sides of the house are covered with sheathing or with heavy paper and the sash are put in place whenever it is desired to start the crop. The plants are set two feet apart each way and given ordinary field culture during the summer.

SUMMARY.

Constant watchfulness and the exercise of good judgment are of more importance than adherence to set rules.

A single house standing alone, covering 2,000 square feet of surface, will require about twenty-five tons of coal for the year.

One good man with occasional help should be able to do all the work in houses covering 4,000 square feet of ground surface.

The simplest form of glass structure is the cold frame. Aside from its use in starting early plants it is little used in "winter gardening."

The hot-bed is similar to a cold frame with the addition of "bottom heat."

The uneven span house is the form in most common use. The even-span is used mainly for narrow propagating houses and for conservatories.

The best green house wall is that which, at least expense, is perfectly rigid, is durable, and will effectually shut out drafts of cold air. A cheap and effective wall is made by the use of posts and matched boards.

The glass for greenhouse roofs should be second quality, double thick and of good size—14x22 or 16x24 inches preferred.

The object of ventilation is to purify the atmosphere, rather than to lower the temperature.

In modern greenhouse heating we have only to consider two general systems—steam and hot water in closed circuits.

In general, solid beds are advocated for plants requiring no bottom heat, such as cauliflower, lettuce, radishes, etc.; while for semi-tropical plants like melons, beans and tomatoes, benches are preferred.

When and how to apply water is more important than the source of supply.

There is a marked difference in the ability of plants to stand direct sunlight.

The secret of success is to have something on the ground constantly. The most important crops are lettuce, tomatoes, cucumbers and radishes. Asparagus, bean, parsley, etc., are valuable for keeping up a succession of crops.

NOTES ON PLANTS.

F. L. HARVEY.

Specimens of the following plants have come to the Station from correspondents during the year. The sender has been given the information asked and in some instances the weeds have been made the subject of newspaper articles and bulletins.

WILD PEPPERGRASS (*Lepidium intermedium Gray*) has been reported from many localities this season. It is becoming quite common along roadsides and waste places about towns. Source, western clover seed.

RABBIT-FOOT CLOVER is becoming a common weed along roadsides and in waste places about towns.

VETCH (*Lathyrus palustris.*) Coarse and fine-leaved varieties are very common in Southern Maine along railroad embankments and in car yards. It is spreading.

THE ORANGE HAWKWEED has been reported from several new localities. It should be carefully looked after.

RAG WEED (*Ambrosia artemisiaefolia*) is becoming a common weed along roadsides and in fields. It is an annual and could be easily eradicated with care.

THE WILD CARROT is spreading rapidly in some places. In many localities in the State it is allowed to grow along roadsides unmolested, to scatter seed far and wide.

THE SOW THISTLE (*Sonchus arvensis*) is becoming very common in cultivated fields. Clean culture would eradicate it.

THE GROUND CHERRY (*Physalis Virginiana*) was reported the past season for the first time. The plant probably came from the West in clover seed.

THE BUFFALO BUR (*Solanum rostratum*) made its appearance the last season where carloads of western corn were screened. This plant was considered in a special bulletin.

THE CLOVER DODDER continues to be reported from new localities.

BUTTER AND EGGS is becoming a bad weed in Maine. It usually contents itself by growing along roadsides and in waste places, but this season we saw a field overrun with it. The second crop of seeds had matured after the grain was cut.

YELLOW RATTLE (*Rhinanthus crista-galli*) is becoming a great nuisance in grass lands on the islands along the coast and adjacent sea shores. It is an annual and careful culture would check it. We saw this weed along roadsides at Jackson.

GREEH AMARANTHUS or PIG WEED is one of the most common garden weeds in Maine. It will spring up and perfect its seed after the crops have gone by. It should be pulled in the fall before it seeds.

CULTIVATED RYE appeared as a weed in many fields in Maine the past season. Probably introduced with grass seed. Its tall stalks made it conspicuous and growing as a weed it was not recognized by many.

CULTIVATED FLAX is introduced in western clover seed and it is not uncommon to see the beautiful flowers of this plant in fields.

THE STRAWBERRY LEAF BLIGHT is the most common strawberry fungus in Maine, producing brown spots on the leaves.

THE BLACKBERRY RUST was quite abundant the past season. As this fungus lives over winter in the plants, nothing short of destroying the infected plants before they scatter the spores will eradicate the disease.

PLANTS EXAMINED IN 1896.

No.	Common Name.	Technical Name.	From Whom Received.	Remarks.
1	Red Baneberry	*Actæa spicata rubra*	A. N. Lufkin, East Orrington.	
2	Wild Peppergrass	*Lepidium intermedium*, Gray.	Fred S. Hayes, Oxford; A. N. Lufkin, East Orrington; H. H. Payson, Hope; L. O. Straw, Newfield; E. G. Barker, Easton	Weed in fields and waste places. Introduced in western clover seed.
3	Spurry	*Spergula arvensis*, L.	I. N. Lapham	Weed in grain fields. Sometimes cultivated for forage.
4	Bladder Ketmia	*Hibiscus Trionum*, L	Samuel Libby, Orono	Weed in garden.
5	Rabbit-foot Clover	*Trifolium arvense*, L.	J. G. Harding, Waldo	Weed in fields and along roadsides.
6	Vetch	*Lathyrus palustris*.		
7	Purple Flowering-Raspberry,	*Rubus odoratus*, L	B. W. McKeen, Augusta.	
8	Orange Hawkweed	*Hieracium aurantiacum*	O. S. Overlock, South Liberty, and others.	
9	Ragweed	*Ambrosia artemisiæfolia*, L.	J. B. Alline, Addison, and others.	In grass fields.
10	Yellow Daisy	*Rudbeckia hirta*, L	Chas. Plummer, Jr., Charleston.	Weed in cultivated land easily eradicated. From the West.
11	Sow Thistle	*Sonchus arvensis*, L	B. W. McKeen, Augusta.	Weed in cultivated ground.
12	Husk Tomato, or Ground Cherry,	*Physalis Virginiana*, Mill.	J. W. Butterfield, East Dixfield	Introduced in western clover seed.
13	Buffalo Bur	*Solanum rostratum*, Dunal.	E. C. Carll, Buxton	Came up where cars of western corn were unloaded.
14	Clover Dodder	*Cuscuta epithymum*, Murr	A. Merriman, Harpswell Center.	Parasite on clover.
15	Butter and Eggs	*Linaria vulgaris*, Mill.	Daniel Lindsay, Carroll	Weed along roadsides and in fields.
16	Pubescent Beardstongue	*Pentstemon pubescens*, Solander	F. E. Bixby, Anson.	Weed in cultivated field.

PLANTS EXAMINED IN 1896—CONCLUDED.

No.	Common Name.	Technical Name.	From Whom Received.	Remarks.
17	Yellow Rattle	*Rhinanthus Crista-galli*, L	R. S. Warren, South Deer Isle	Weed on sandy seashore.
18	Pigweed, Green Amaranthus	*Amarantus retroflexus*, L	E. E. Light, Union	Weed in cultivated ground.
19	Black Bind-weed	*Polygonum convolvulus*, L	Various parties	Introduced in western grain.
20	Coral-Root	*Corallorhiza multiflora*, Nutt	N. W. Lennard, Thomaston	Sent for name.
21	Cultivated Rye	*Secale serale*	E. E. Paine, Jay L. F. Abbott, Lewiston	Weed in cultivated fields.
22	Hungarian Grass	*Setaria Italica*	B. W. McKeen, Augusta	For name. Weed in fields.
23	Strawberry Leaf-blight	*Sphaerella fragariae*, Sacc	Various parties	Very common in Maine.
24	Blackberry Rust	*Cœoma nitens*, Schw	F. A. C. Emerson, Garland	Attacking the leaves of living blackberries.
25	Pear Leaf Blight	*Entomosporium maculatum*, Lev	W. L. Mace, East Winthrop	Attacking the leaves and twigs of pears, causing them to turn black.
26		*Cenangium conspersum*, Fr	R. C. Fuller, Wilton	Attacking apple trees.

WEEDS AND SEEDS.

That weeds are increasing in Maine is apparent to anyone whose attention has been called to the matter. Scarcely a year goes by without the introduction of some new weed not previously reported from the State. The spread on the farm, or from farm to farm of old acquaintances is of common occurrence.

The weed question has become a serious one to the farmers of Maine. It is a hopeful sign that public opinion is becoming aroused on the subject.

There are several causes for the introduction and spread of weeds, but they are largely under the control of farmers through personal attention and legal enactment.

Weed seeds may get into the State in discarded ballast from vessels; through packing material from other states and countries; on through cars; by migrating birds and other minor sources, although these latter causes are only occasional and accidental. By far the most serious and certain causes are the annual importation of seeds for planting and grain for feed. In later years farmers have grown less grain than formerly and the demand has steadily increased with our growing stock industry. We are more dependant than ever upon other states both for seeds and grain for feeding. With this foreign seed and grain have been introduced the weeds growing in the regions from which they came.

Farmers have not been alive to the importance of not introducing weeds into their fields and have been quite indifferent in regard to the quality of the seeds they have sown and the grain they have fed. They have not seen the importance of destroying weeds in their fields when first introduced; have allowed them to overrun the farm and spread from farm to farm until the fighting of weeds has become a most serious problem. There being no laws against the selling of seeds and grain harboring the seeds of bad weeds, dealers have taken no great pains to offer for sale a quality of seed better than the consumer demanded. Farmers in Maine are largely using a third grade seed when they could get a first grade by paying a little more for it. Dealers say that farmers often from choice take a poorer grade of seed when a better could be had at a few cents more per bushel. We learn that most of the seed sold in Maine is distributed from Chicago and goes through a screening process to get the weed seeds out. It is by no means thoroughly cleaned. That the seed offered for sale could be farther improved and the percentage of weed seeds reduced to a minimum we have no doubt. All farmers have to do is to demand a clean seed and it will be grown. The price would be higher, but it would be much cheaper in the end. We do not believe that a uniformly absolutely pure seed can be grown. Scattering weed seeds must be expected and farmers must be alive to destroying the scattering weeds that appear in their fields the year they seed and the year following. The remedy would be to demand a purer seed and then carefully destroy the scattering weeds that spring up before they spread.

We believe farmers have overlooked grain brought on the farm for feed, as a source of weeds. *We believe more bad weeds are introduced this way than by seeds.* The seed sold in Maine is screened, while that imported for feed is not screened. The latter would naturally harbor more weed seeds, as the cleaner grain is always selected for seed. Grain is scattered where the cars are unloaded and along highways from the centres of distribution to the farm. In feeding on the farm it gets into manure and thence into the fields. We learn from good authority that grain brought in by the carload for feed is sometimes retailed for seed, and that farmers knowingly, to save (?) a few cents, sow such inferior seed. To determine how far grain imported for feed is a source of weed distribution in Maine we addressed a letter to the Maine Central Railroad and received the following reply:

Professor F. L. HARVEY,

Maine State College, Orono, Me.:

Dear Sir,—I have your communication of the 3rd inst., and beg to give you the information that the delivery of cars loaded with western grain is not confined to any one or to a few principal points along our line, but I am sorry to say, for your purpose, that such cars are regularly delivered at every station, though some may receive a larger proportion than others, and such stations I should say would be Portland, Brunswick, Bath, Gardiner, Augusta, Waterville, Auburn, Lewiston, Winthrop, Oakland, Livermore Falls, Farmington, Skowhegan, Pittsfield, Newport, Dexter, Foxcroft, Belfast, Bangor, and on our White Mountain Division like Fryeburg, Brownfield, Cornish, Steep Falls and Sebago Lake.

That western grain brought in by the carloard is often very foul with weed seeds will appear from the following:

One party sent us a *pound* of seed oats from the West, purchased from a local dealer who represented it as cleaned seed and charged several cents per bushel more for it. It was probably unscreened grain from cars. An examination of this seed gave the following results: 1,160 mustard seeds, 576 black bind-weed, 111 goosefoot, 13 smartweed and sorrel, 28 flax seed, 20 grass seeds, several foxtail, 4 wild morning glory, 3 bugloss and several seeds of six different kinds of compositae, not identified.

From another party we received samples of foul seed screened from oats bought for seed. Eight ounces of the foul seed contained as follows: Black mustard, English charlock, jointed charlock, shepherd's purse, pigweed, bind-weed, smartweed, bugloss, flax seed, morning glory, several kinds of grass seed and compositae, and one seed that looked like the Russian thistle.

Samples like the above are not uncommon. We have examined western oats that were fully one-third by weight jointed charlock. The past season a weed new in Maine, the buffalo bur, came up where a carload of western grain was unloaded and screened. Every town where cars are unloaded is liable to become a centre of weed distribution. The only remedy for this is for farmers to use ground feed and not import whole grain.

In the solution of the seed and weed question the following points may be worthy of consideration by the farmers of the State:

1. As far as possible seed grown in the State should be used. Even if such seed be weedy, no new weeds are likely to be introduced. Many farmers grow clean seed on their farms and thus escape the introduction of weeds.

2. Purchase the best the markets afford, as to plumpness, brightness and freedom from weed seeds. If dealers do not keep a satisfactory seed, demand better and it will be provided. It is best to buy early before the rush of planting time.

3. Farmers should watch their fields carefully, especially after seeding, and destroy any new weeds that appear before they seed and spread. This is absolutely necessary, as seed entirely free from weed seeds is not on the market.

4. Farmers should be alive to the importance of clean culture and the necessity of destroying weeds along roadsides, fence corners, hedge rows and waste places. Weeds take the food supply from plants grown for profit, reduce the yield per acre and are themselves worthless. It takes time and money to kill weeds and they yield no return. It becomes an endless job if weeds are allowed to propagate themselves about the fields and annually scatter a fresh supply of seeds. Better strike a blow at the sources of weed seeds. It would be cheaper in the end.

5. Railroad companies should be made responsible for not destroying weeds that spring up in car yards and about depots where cars of western grains are unloaded, and along railroad embankment where weeds frequently spring up from seed brought long distances in ballast or dropped from passing cars. It is unjust that the farming community should suffer from the carelessness of corporations. Towns should be held responsible for allowing weeds to grow in the streets and roads, around lots, and in waste places, to become centres of distribution to farms.

6. Property owners, residents and non-residents should be responsible for harboring weeds along the roadsides fronting their property. This is desirable to protect careful farmers from their shiftless, thriftless neighbors and from weed patches on unoccupied land.

7. As grain brought in by the carload harbors so many weed seeds, the attention of farmers is called to the danger they run in bringing whole grain on the farm for feed.

NOTES ON THE INSECTS OF THE YEAR.

F. L. HARVEY.

WOODLOUSE OR SOW BUG, a crustacean belonging to the genus Oniscus, was reported as doing damage in mushroom cellars by eating the fungi. They can be killed by putting pieces of potato poisoned by a solution of arsenic in the beds.

CROTON BUGS were received from Monmouth, Me. These no doubt were introduced in packing materials. This insect is quite abundant in some towns in the State. It is an importation from Europe. They frequent houses especially about water pipes. Free use of insect powder scattered where they frequent is said to destroy them.

THE OYSTER-SHELL BARK-LOUSE is exceedingly abundant and is increasing rapidly. As it saps the vitality of trees without attracting much attention, it is overlooked. It seems to thrive better in the North, being worse in Maine than farther south. It does more injury to young trees. We have received information this season of orchards of young bearing trees so badly infested that the twigs of all the trees were literally covered with the scales. The life history of this scale is given in the Report of this Station for 1888, p. 157, but we wish to add the following regarding treatment. The usual way is to apply a dilute alkaline wash to the trees in the spring after the young lice hatch. These scales could be treated in the winter at any time by applying thoroughly to the trees and small branches with a brush a *strong* alkaline wash, made by dissolving two pounds of whale oil soap in one gallon of water. The cost of the material would be more for the strong wash, but there is more leisure in winter to do the work. The strong wash should not be applied after the leaves start.

THE HEMISPHERICAL SCALE was found quite abundant upon ferns grown in the house at Orono. It is also found on ferns in the Station forcing house. It yields readily to treatment with alkaline or kerosene alkaline solutions.

THE ELM-TREE BARK-LOUSE considered in the Report of this Station, 1894, page 83, was reported again this season as abundant on elms.

The elms in Maine are also infested with CANKER WORMS, MOURNING CLOAK BUTTERFLY, THE OAK-BARK WEEVIL and the STEEL-BLUE FLEA BEETLE, (*Haltica chalybea.*)

THE BUFFALO TREE HOPPER was reported this season for the first time as doing damage to the foliage of apple trees. It is pale grass-green in color, marked with whitish dots and a pale yellow streak along each side. It is an active, jumping insect. The form and size are shown in the accompanying plate, Fig. 1.

THE YELLOW-NECKED APPLE-TREE CATERPILLAR was reported this season for the first time as feeding on the foliage of apple trees. The small white round eggs of this insect are laid side by side in nearly straight rows on the under surface of the leaves. The young larvae eat only the pulp of the leaves. When older they devour all but the stem, destroying all the leaves on a branch. The full grown caterpillars are about two inches long. The head is large and black. The joint next to the head is dull orange. There is a black stripe down the back and four yellow stripes down the sides, alternating with three black ones. Body clothed with soft whitish hairs. Fig. 5 shows the caterpillar in the position it assumes (with the head and tail up) when disturbed. Though partial to apple trees, it attacks plums and pears and several kinds of deciduous trees. It is capable of doing great damage when abundant. The larvae feed together and the branch on which they occur can be cut off or the clusters of insects crushed.

THE FALL CANKER WORM so abundant for several years has not been abundant the past season, though doing some damage in southern and western Maine.

THE CURRANT SPAN WORM is very abundant about Orono. Our attention was called to currant and gooseberry bushes almost barren of foliage from the attacks of this insect. It is very different from the Currant Sawfly worm, which is so common in Maine. It is the larva of a geometrid moth, and has the habit common to inchworms of arching the back when crawling. When full grown it is about an inch long, whitish in color, with a yellow stripe down each side and another along the back. The segments are spotted with black. There is but one brood in a season. The larvae have the habit of suspending themselves with a silken thread when disturbed. Fig. 4 shows the larvae, pupa. The moth is shown in Fig. 2. Hellebore will not destroy this insect. Paris green would be effective, but the worms are worst when the fruit is nearly grown. Possibly a strong wash of whale oil soap and water applied in the winter might destroy the eggs which are deposited on the twigs and branches.

THE GOOSEBERRY FRUIT WORM seems to be on the increase. It is common on the wild gooseberries in Maine and may spread from this source. This worm is the larva of a small moth which is shown in Fig. 3 b. The cocoon is shown in Fig. 3 a. The larva, Fig. 3 c. The moth deposits its eggs upon the young berries and the worms gnaw into the fruit. As they grow, several berries are enclosed in a web, and the worms live on them. Infested berries ripen prematurely. When disturbed, the worms let themselves down quickly by a thread, which makes it difficult to destroy them by hand picking. Rubbish should be removed from under the bushes where the insect hibernates.

THE LIME TREE WINTER MOTH was reported this season in injurious numbers. It seems to remain where the Fall Canker Worm has about disappeared. It was considered and figured in the Report of this Station, 1893, page 161.

THE ARMY WORM made its appearance in limited numbers at Corinth. Mr. W. E. Jordan, who sent us specimens, reported it as feeding on oats.

THE ASH-GRAY PINION was reported again this season as eating into apples. This species is figured in the Report of this

Station, 1888, page 176. The larva of *Pororgia Clintonii* was reported from Aroostook county as feeding on the foliage of apple trees.

THE VELLEDA LAPPET MOTH. This insect was received from Western Maine where it was mistaken for the Gypsy Moth. This species having never been reported before from Maine we give cuts of the moth and larvae.

The body of the larva is covered with warts, which bear tufts of black hairs. On the back and at the sides, gray hairs are mixed with the black. When at rest the caterpillars lie close to the twigs and are hard to see. The flat under-surface is pale orange marked with black dots. See Fig. 6. The moths are gray and white. See Fig. 7.

THE APPLE-TREE TENT CATERPILLAR was very abundant the past season in Western and Southern Maine.

The season has been remarkable for the great number of leaf eating insects reported. Besides those noted or found in the list printed above there were several species of budmoths and leaf rollers, that did much damage. These insects could be controlled by spraying, a practice that is gradually coming into favor among fruit growers in Maine, but which could be employed profitably much more than at present.

THE CURRANT FLY (*Epochra Canadensis*) was more abundant than ever the past season about Orono. It is not generally distributed. There are none in the Station garden, though badly infested gardens occur in Orono.

THE APPLE MAGGOT (*Trypeta pomonella*), we are happy to say, has nearly disappeared in several localities during the past season where it was very bad before. Whether it has really gone or whether the large apple crop has made it appear less numerous on account of abundant food supply is a question. It is probable, however, that the late appearance of snow for the past two years together with freezing and thawing have destroyed the pupae, which are deposited so near the surface. Flies as a class are fragile and subject to injury by great climatic changes.

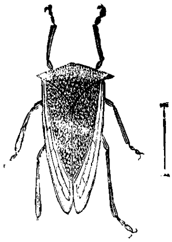


FIG. 1.

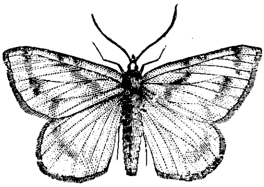


FIG. 2.

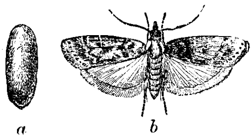


FIG. 3 a & b.

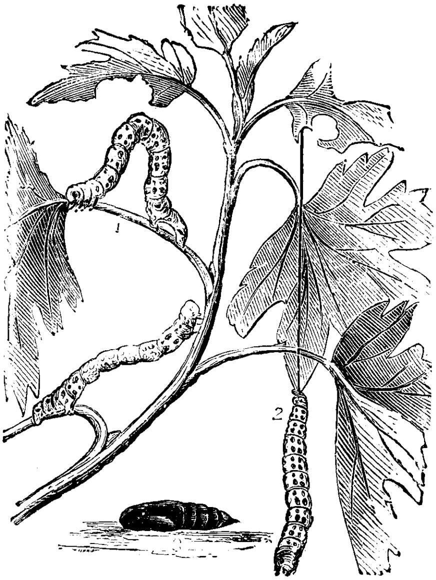


FIG 4.

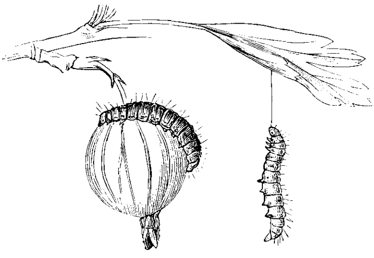


FIG 3 c.

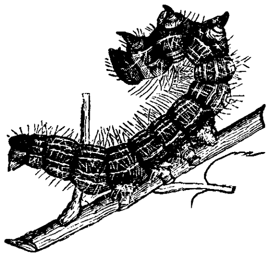


FIG. 5.

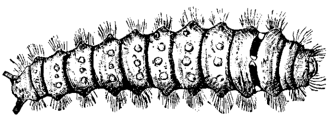


FIG. 6.

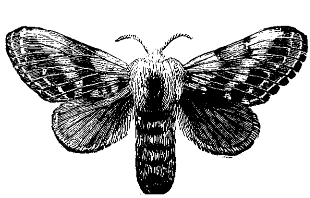


FIG. 7.

RAT-TAIL LARVA, the maggot of a species of two winged fly which has a long tail-like appendage to the body, was received for examination.

These maggots live in water or liquid decaying organic matter. So say the books. The long tube like a tail is used as a respiratory organ. One of the specimens received was taken in chip dirt on the floor of a wood-shed. It would seem that they also live in dry situations and put the tube to the surface of the debris to breathe.

From one of the specimens came a large yellowish brown fly. These flies live on the pollen of flowers and are often seen about flowers during the summer.

THE HORN FLY continues to be reported but seems to be on the decrease in Maine.

THE BUFFALO BEETLE is spreading. We have had word of it from several new localities the past season.

THE PIGEON TREMEX is doing considerable damage to maple and other shade trees in some parts of the State.

PTINUS FIR, a small beetle, was reported as badly infesting a bag of timothy seed. The bag had been hanging in a finished room from May until the following March. When examined, thousands of the beetles were found. This is an introduced species from Europe. Probably a few got in before the seed was hung up, and multiplied.

INSECTS EXAMINED IN 1896.

No.	Common Name.	Technical Name.	From Whom Received.	Remarks.
1	Wood-louse. Sow Bug	*Oniscus species*	B. Walker McKeen from Auburn,	Eating mushrooms in cellar.
2	Cat Tick	*Ixodes erinaceus*	T. D. Morril, North Yarmouth	On domestic cat.
3	Croton Bug	*Phyllodromia Germanica*	Mrs. M. O. Edwards, Monmouth.	In store. Probably brought in packing material.
4	Grape-vine Leaf-hopper. Thrips	*Erythroneura vitis*, Harris	Ora Knight, Bangor.	
5	Oyster-shell Bark-louse	*Mytilaspis pomorum*	A. S. Field, Bangor Fred S. Wiggin, Maysville	On apple trees.
6	The Hemispherical Scale	*Lecanium hemisphæricum*, Targioni	Eben Webster, Orono.	On ferns in house.
7	Elm-tree Bark-louse	*Lecanium*	C. H. Morrell, Pittsfield.	
8	The Buffalo Tree-hopper	*Ceresa bubalus* (Fobr.)	R. A. King, East Monmouth	On foliage of apple trees.
9	Yellow-necked Apple-tree Caterpillar	*Datana ministra* (Drury)	J. F. Talbot, Andover	Eating foliage of apple trees.
10	Red-humped Apple-tree Caterpillar	*Œdemasia concinna* (Sm. & Abb.)	F. E. Bixby, Anson	Eating foliage of apple trees.
11	The Fall Canker-worm	*Alsophila pometaria*	Gilman Blood, Foxcroft.	
12	The Currant Span-worm	*Diastictis ribearia*	F. L. Harvey, Orono.	
13	The Gooseberry Fruit-worm	*Dakruma convolutella* (Hübn.)	Mrs. W. H. Davis, West Gardiner,	Attacking the fruit.
14	The Lime-tree Winter Moth	*Hybernia Tiliaria*, Harris	Gilman Blood, Foxcroft R. A. King, East Monmouth	Attacking apple trees. Attacking apple trees.
15	The Army Worm	*Leucania unipuncta*	W. E. Jordan, Corinth	Attacking oats.
16	The Ash-gray Pinion	*Lithophane anthennata* (Walker)	C. H. Davis, Harmony	Eating into apples.
17	.....	*Pororgia Clintonii*	Bagely Bros., Caribou	Larva feeding on apple.
18	The Plum-tree Sphinx	*Sphinx drupiferanum* (Sm. & Abb.)	O. S. Shaw, Winthrop	On apple tree.
19	Fall Web-worm	*Hyphantria textator*, Harris	A. T. Wing, Weld	Pupa on limb of apple tree.

20	THE VELLEDA LAPPET-MOTH. ...	*Tolype Velleda* (Stoll)	C. H. Thompson, Jay.............	Mistaken for gypsey moth.
21	APPLE-TREE TENT-CATERPILLAR.	*Clisiocampa Americana*, Harris....	D. J. Bixby, South Turner, and several others.	
22	LUNA MOTH........	*Tropæa luna*..	S. J. Spalding, North Buckfield.	.
23	CECROPIA MOTH	*Platysamia Cecropia* (Linn.).......	C. Fenderson, Wilton	Cocoon on apple tree.
24	MOURNING CLOAK BUTTERFLY...	*Vanessa antiopa*, L	C. H. Morrell, Pittsfield.	
25	RAT-TAIL LARVA	*Mollota*...	H. W. Goodwin, West Lewiston..	In decaying organic matter.
26	HORN FLY	*Hæmatobia serrata*	J. E. Crocker, St. Albans....	On cattle.
27	BUFFALO BEETLE...	*Anthrenus Scrophulariæ*, L........	Isabel F. Hinckley, Bangor, and others	Destroying carpets.
28	BACON BEETLE	*Dermestes lardarius*	B. H. Dunham, Foxcroft..........	In pantries from May until October.
29	SUGAR MAPLE BORER.	*Plaginotus speciosus*....	Sam. Richards, South Paris	Doing injury to maple trees.
30	....	*Ptinus fir*	William L. Jackson, Greenfield..	Destroying stored Timothy seed.
31	PLUM CURCULIO.	*Conotrachelus nenuphar* (Herbst.).	Chas. Vaughn, Hallowell	Attacking plums.
32	OAK-BARK WEEVEL.....	*Magdalis olyra* (Herbst.)	C. H. Morrell, Pittsfield....	Elm trees.
33	LESSER GRAIN-BEETLE...........	*Sylvanus surinamensis*, L	N. A. Haskell, New Gloucester ...	Specimens from Massachusetts.
34	ASH TIMBER-BEETLE	*Hylesenus aculeatus*, Say....... .	W. L. Mowyer, Greene.	
35	MAY-BEETLE	*Lachnosterna fusca* (Frohl.)	Miss M. Minot, Bar Harbor.......	Feeding on grass roots in lawn.
36	CUCUMBER FLEA-BEETLE	*Crepidodera cucumeris* (Harris). ..	B. W. McKeen, Augusta	On potato leaves.
37	STEEL-BLUE FLEA-BEETLE	*Haltica chalybea*	C. H. Morrell, Pittsfield..........	On elms.
38	PEAR-TREE SLUG	*Selandria cerasi*, Peck.............	C. H. Morrell, Pittsfield..........	Eating foliage of pear trees.
39	BLACKBERRY SEED-GALL	*Diastrophus cuscutæformis*, O. S ...	E. F. Roundy, Bangor............	Making gall-like excrescence on blackberry leaves.
40	ICHNEUMON	*Pelecinus polyturator*..............	F. W. Gifford, Dover	About orchards. Probably beneficial.
41	PIGEON TREMEX..................	*Tremex Columba*, L................	S. Richards, South Paris.........	Boring in maple trees.

A NEW GARDEN SMYNTHURID.

Smynthurus albamaculata n. sp.

By F. L. Harvey.

Body dull blue-black with steel blue reflections in direct light, obscurely marked with numerous small whitish blotches of variable shape and size, arranged in poorly defined transverse bands, giving a marbled appearance. Head, terminal segments of the body, antennae, legs and elater pale purple. Underside of body pale brownish. Sides of head and the vertex yellowish brown. Eye patches black, bordered on the inner margin by a whitish band which is constricted in the middle giving the appearance of two spots. Antennae more than half as long as the body. Ratio of segments 1:2½:3:5. The basal joint widest, globular and whitish. Base of the second segment light. Terminal segment composed of nine joints. (In young specimens apparently eight jointed by the coalescence of the two terminal). Antennae, legs, elater and body clothed with hairs. Body widest behind, abruptly narrowing into the terminal segments. Anal tubercles prominent. Claws medium size. The larger, .031 m. m. with a single tooth on the inner edge near the end. Short claw, .017 m m. plain, broadest in the middle. Two tenent hairs about the length of the longer claw and extending about two-thirds the length of the claw. Furcula short and stout. Ratio to body 4:7. Ratio of parts of furcula: manubrium 4, dentes 4, mucrones 1. Dentes with about ten bristles on the lower edge. Mucrones curved near the base, narrow lanceolate and plain. Length of insect .8 to 1.4m m.

Habitat:—Found abundantly during May and June in gardens. Doing much damage to early garden plants. Attacks radishes, beans, cucumbers, squashes, etc., eating numerous holes in the epidermis of the leaves and sucking the

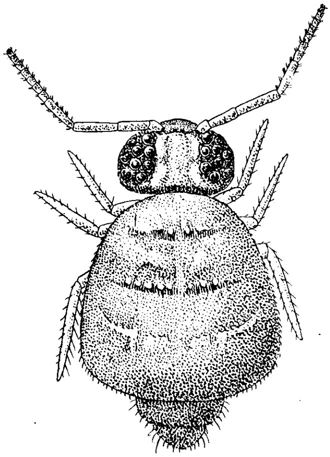


Fig. 1.

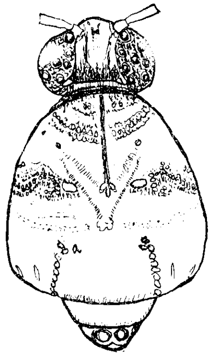


Fig. 3.

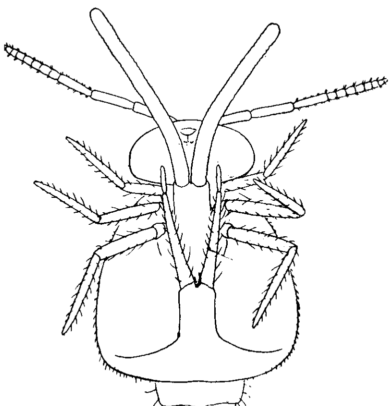


Fig. 2.

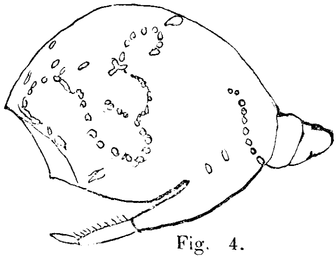


Fig. 4.

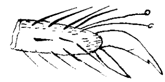


Fig. 5.

SMYNTHURUS ALBAMACULATA, Harvey.

juices until the leaves wither. Numerous specimens examined during the last five years. Orono, Me., F. L. Harvey.

Distinguishing characters:—This species has the same habits as Fitch's *S. hortensis* and is equally as injurious. For a long time we took it for that species. It has the dark body and lighter head, legs, antennae and elater of the above. It is, however, readily distinguished by the purple of the head, antennae, terminal segments of the body and elater, the obscure white markings on the body and especially by the nine joints to the terminal segment of the antennae. There being in *S. hortensis six* segment to the terminal joint, according to Fitch and McGillivray—but really seven if Fitch's figure is correct. The only species we know of having been found in America with nine joints to the terminal segment of the antennae is *S. roseus*, Packard, from which our species differs in the color of the body, size and habits.

Remarks:—The young of this species are lighter colored than the adults, appearing brownish to the naked eye and often show only eight joints to the terminal segments of the antennae. The older specimens acquire the blue black color and reflections. The marbled appearance of the body cannot be seen by the naked eye or a hand glass readily and the casual observer would say the body was plain, blackish. The whitish markings can be readily seen by magnifying 75 diameters. They appear as though they were under the skin and show through it. Alcohol and glycerine specimens show the markings plainly.

By careful examination of alcoholic specimens we found there was a median dorsal brownish stripe extending from the head half the length of the body and ending in a clover leaf white spot. There are three obscure transverse bands made up of white spots, giving the surface a mottled appearance. The anterior band from dorsal view shows two white spots each side the median line. The second stripe bears five oblong spots each side of the median line and lower on the sides an S shaped marking composed of a chain of white blotches. Still lower on the side and anterior to the first and sloping forward is another S formed by a chain of spots, the lower loop of the first S making the posterior loop of the second. See Fig. 4.

Starting near the base of the manubrium and running obliquely up the side of the body and ending in the dorsal view is a stripe of oblong whitish spots. The white spot next to the dorsal end placed inward out of line. Fig. 3, a.

We have tried to show the arrangement of these markings in Figs. 3 and 4.

Description of Figures:—Fig. 1, drawn by Mr. J. H. Emerton from live specimens, shows well the form of the body and the obscure transverse bands. The drawing was made from live specimens. Fig. 2, drawn by Mr. Emerton, shows a ventral view of the same. Fig. 3, drawn by the writer, shows in detail the white markings as seen in alcoholic specimens, examined by high powers. No attempt is made to show more than the location of the markings. Fig. 4, is a side view showing location of the spots. Fig. 5, shows structure of the foot.

Remedies:—We do not agree with Fitch that the work of the Smynthurids is entirely secondary, at least this species is capable of sucking the juices in some way without the aid of other insects. The above species was very abundant on cucumbers in my garden this season but we did not notice the Flea Beetle. Some times there would be more than a dozen on a single leaf. In a few days the leaves turned whitish and on examination the epidermis was found full of little pits. Rarely, if ever, was there a hole through the leaf. They attack the new, young plants, eating the seed leaves (cotyledons). The application of dirt, ashes, sulphur or pyrethrum while the dew is on will act as deterrents until the plants are larger when they appear to do but little damage. We searched for specimens June 25th, and found them very scarce.

METEOROLOGICAL OBSERVATIONS.

Reported by L. H. MERRILL.

These observations were made under my direction, by members of the Station force. Readings were taken at 7 A. M., 1 P. M. and 9 P. M. The instruments were those in general use by the Weather Bureau. Lat. 44°, 54′, 2″, N. Long. 68°, 40′, 11″, W. Elevation above the sea, 150 feet.

METEOROLOGICAL SUMMARY

FOR THE SIX MONTHS ENDING DECEMBER 31, 1896.

	July.	August.	September.	October.	November.	December.	Mean.
Highest barometer	30.56	30.43	30.53	30.71	30.94	30.89	30.68
Lowest barometer	29.69	29.85	29.57	29.57	29.69	29.27	29.60
Mean barometer	30.10	30.14	30.17	29.93	30.27	30.20	30.14
Highest temperature	86	92	87	68	68	45	74
Lowest temperature	55	39	28	23	-4	-9	22
Mean temperature	66	65	55	45	35	20	48
Total precipitation	2.58	4.26	8.00	3.75	4.23	1.30	
Number of days with precipitation of .01 inch or more	6	10	9	15	11	6	
Number of clear days	......	10	7	9	5	15	
Number of fair days	....	11	15	9	11	11	
Number of cloudy days	......	10	8	13	14	5	

DIETARY STUDIES AT THE MAINE STATE COLLEGE.

The investigations upon the food and nutrition of man referred to in the Director's Report as in progress in coöperation with the United States Department of Agriculture are reported upon, for the year 1895, in Bulletin 37 of the Office of Experiment Stations on "Dietary Studies at the Maine State College," by W. H. Jordan, the former Director of this Station. The following brief abstract is from that bulletin. A limited number of copies of Bulletin 37, containing the full account of these studies, are at the disposal of the Station. They will be sent to applicants until the supply is exhausted. C. D. W.

Recent discussions in the field of human food economics have dealt largely with the problems involved in purchasing the so-called raw materials. The man of moderate means is taught that whether he is well fed or not does not depend upon what he pays for the food supplied to his family, but is determined by the amount and kind of nutritive ingredients which he consumes. He is told further that the protein from the neck is just as nutritious as the protein from porter-house steak when the skill of the cook renders it as palatable and digestible. It has been repeatedly demonstrated on the basis of chemical analysis and market prices that the edible dry matter of oysters, clams, poultry, and the choice cuts of beef has a market cost much greater than that of the edible dry matter from a fore quarter of beef, or from pork, milk, and cheese. Consequently the housewife and boarding-house steward are assured that there is an opportunity to keep down the cost of supplying the table by purchasing those materials which furnish a unit of nutrition for the least money, provided they can be prepared for the table in such palatable forms that they are relished and eaten without excessive waste.

It is quite evident, however, that these conditions are more difficult in the concrete than in the abstract. The lack of culinary skill, the necessity for a desirable variety of foods, and the marked differences of individual tastes are all obstacles to the easy application of laboratory demonstrations to the management of a dietary.

It was felt that if these views of food economics could be made useful in practice it would be well worth while to show this by accurate experimental data. It was decided, therefore, that nothing could be undertaken more desirable from a practical standpoint than to attempt an application of the considerations above mentioned.

The work attempted was something more than an ordinary dietary study where the supply of raw materials was simply such as would be dictated by the season, condition of the market, etc. It was rather a dietary study where the supply of raw materials was deliberately controlled in such a manner as to make possible a comparison of the relative cost of different sources of supply.

Whatever opinion may be entertained as to the success and value of this experiment, it certainly has the merit of being perhaps the first attempt in this country to apply to the study of human food economics the same deliberate control of the rations that has for a long time been exercised in similar experiments with farm animals.

THE COLLEGE COMMONS AND THE CONDITIONS UNDER WHICH THE EXPERIMENTS WERE MADE.

The college boarding house is connected with a dormitory, and is patronized chiefly by the students living in the dormitory and in neighboring fraternity club houses. Certain members of the college faculty and a few outside students take their dinners at the boarding house regularly, and others occasionally, thus making a larger number of dinners than of other meals. The regular student boarders were, with a single exception, all young men whose ages ranged from seventeen to twenty-three years, and who weighed on an average about 150 pounds.They were all compelled to take a fair amount of physical exercise, due to enforced military drill and to afternoon practice work in the laboratories and with engineering instruments in the field. It may be reasonably claimed that these young men performed a considerable amount of work. There were also several women, boarders and employees, who had meals regularly at the commons.

The college commons is conducted on the plan of furnishing the students with their board at cost, with the expectation that the weekly charge shall not exceed $3 nor fall below $2.50. As a matter of fact, the cost during these dietary studies was about $2.75 per week.

The general plan of the studies may be briefly outlined as follows: At the beginning of each dietary study a careful inventory by weight was taken of all the food and food materials in the house. During the experimental period all food purchased was weighed and recorded in the same way, and all table and kitchen waste carefully collected, weighed, and desiccated for subsequent analysis. At the close of the period a second inventory of all materials on hand was taken. In this way the necessary data for ascertaining the net amounts of food consumed were secured. In nearly all cases, except with meats, samples of food materials on hand or purchased during the period were secured for analysis.

THE QUESTIONS STUDIED.

In these dietary studies, as already stated, the attempt was made to deliberately control to some extent the source and supply of animal foods. The object of this control was to bring into comparison high-cost and low-cost foods as a source of protein, with especial attention to the influence of the free use of milk as a low-cost animal food upon the character and cost of the dietary.

Milk was selected for special consideration for the following reasons:

(1) Milk has a widespread use as an article of diet, and in all civilized countries is an important item of food supply.

(2) Milk is a very valuable food. It contains a mixture of the three classes of nutrients in forms that are readily digested and assimilated.

(3) Milk is a low-cost animal food in proportion to its value as based upon chemical analysis. When milk is purchased at $2 per hundred pounds the cost of a pound of edible solids is 15.7 cents, while the cost of a pound of edible solids in beef at $10.50 per hundred pounds is 34.3 cents. This is a comparison of the retail cost of milk with the cost of hind-quarter beef when purchased by the carcass. Beef bought as steak at retail prices would have a much higher comparative cost.

(4) Notwithstanding the high quality and very general distribution of milk as a food, it seems by many to be regarded as a luxury in the purchase of which economy must be exercised. This attitude toward this particular food may in part be explained by the somewhat prevalent notion that a free supply of milk in the dietary is not economical, because it is supposed that as much of other foods is eaten as would be the case if the milk were not taken. This belief runs contrary to certain generally accepted facts which relate to the physiological use of foods, and it only remains for experimental data to prove or disprove its correctness. Again, milk is not given full credit by people at large for its true nutritive value. Surprise is generally occasioned by the statement that a quart of milk has approximately the food value of a pound of steak. It is important to demonstrate for reasons of economy whether, as is the custom with many, it is wise to purchase the least possible quantity of milk and exercise little care in buying meats.

To investigate these questions, five dietary studies were made, as follows:

The first dietary study was made under ordinary conditions, no attempt being made to select the food with any end in view, except to secure the necessary variety. In the second dietary the protein was secured from high-priced sources, and the milk supply was kept at a minimum. In the third dietary study the protein was supplied from less costly sources, and the milk consumption was increased to a maximum. The fourth dietary study was made under normal conditions, except that the milk supply was limited. The fifth dietary study was also made under ordinary conditions, except that milk was very abundantly supplied.

COMPARATIVE QUANTITY AND COST OF ANIMAL AND VEGETABLE FOODS.

It is interesting and suggestive to note the relations in quantity and cost of the animal and vegetable foods in the five dietaries. These relations are very clearly shown in the following abstract of figures from the second table in each dietary:

RELATIVE AMOUNTS OF NUTRIENTS IN ANIMAL AND VEGETABLE FOODS.

	Food materials.	Nutrients.			Cost.
		Protein.	Fats.	Carbohydrates.	
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
First dietary (No. 148):					
Animal food	51.8	59.8	93.5	5.8	63.7
Vegetable food	48.2	40.2	6.5	94.2	36.3
Second dietary (No. 149):					
Animal food	57.4	71.7	96.5	8.6	72.8
Vegetable food	42.6	28.3	3.5	91.4	27.2
Third dietary (No. 150):					
Animal food	58.6	63.4	95.3	9.8	66.4
Vegetable food	41.4	36.6	4.7	90.2	33.9
Fourth dietary (No. 151):					
Animal food	48.7	56.7	94.5	6.7	71.0
Vegetable food	51.3	43.3	5.5	93.3	29.0
Fifth dietary (No. 152):					
Animal food	60.3	64.2	95.7	12.3	73.1
Vegetable food	39.7	35.8	4.3	87.7	26.9
Average:					
Animal food	54.5	63.0	95.0	9.0	69.0
Vegetable food	45.5	37.0	5.0	91.0	31.0

The gross weight of the animal foods purchased varied from 48.7 to 60.3 per cent. of the total food, and their cost varied from 63.7 to 73.1 per cent. of the total cost. The average gross weight of the animal foods for the entire 209 days was 54.5 per cent. of the total food weight, and their proportion of cost was 69.2 per cent. of the total cost. These figures illustrate the relative economic importance of the animal food of the dietary, and, considered in connection with the great variation in the cost of the nutrients in the different kinds of meat, show very clearly the direction in which a family of moderate means has the largest and most promising opportunity for the exercise of economy.

When we see that practically two-thirds of the protein and nearly all of the fat were supplied from the animal foods and over nine-tenths of the carbohydrates from the vegetable foods, it is easy to understand how the character of the diet is readily modified by varying the proportions of the two classes of nutrients. The family that is able to afford a generous supply of meats is very differently nourished from the families of limited means, where the flour barrel is the chief source of food.

THE REFUSE AND WASTE.

That portion of the food materials which was not eaten included not only that which was edible and was really wasted, but also the refuse, or that which, because not edible, was necessarily rejected. The percentages of the waste in the five dietary studies follow:

SUMMARY OF WASTE IN THE FIVE DIETARY STUDIES.

	Total.	Protein.	Fats.	Carbohydrates.	Fuel value.
First dietary (No. 148):	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Animal	7.5	16.1	30.8	....	11.7
Vegetable	9.7	5.3	.9	12.7	8.1
Total	17.2	21.4	31.7	12.7	19.8
Second dietary (No. 149):					
Animal	13.0	29.3	33.9	....	17.8
Vegetable	10.7	5.4	.6	16.3	8.4
Total	23.7	34.7	34.5	16.3	26.2
Third dietary (No. 150):					
Animal	13.5	20.4	50.0	....	21.2
Vegetable	14.1	7.9	.8	19.9	11.3
Total	27.6	28.3	50.8	19.9	32.5
Fourth dietary (No. 151):					
Animal	2.0	5.6	1.0	.1	....
Vegetable	12.9	9.5	11.5	15.5	....
Total	14.9	15.1	12.5	15.6	14.4
Fifth dietary (No. 152):					
Animal	1.8	6.8	1.3	.3	....
Vegetable	13.3	10.2	12.4	16.8	....
Total	15.1	17.0	11.1	17.1	15.1

A fair discussion of the preceding figures requires the statement that the college commons was not under the same management in the spring term, including dietaries 1, 2, and 3, as in the fall term during dietaries 4 and 5.

In the spring term the waste was 17.2 per cent. of organic matter during the first dietary, and increased from this to 24 per cent. in the second dietary and 28 per cent. in the third. The excessive waste in the third dietary was probably due in part to the large proportion of fat in the meats, which would be rejected during warm weather.

Dietaries 4 and 5 stand in strong contrast to dietaries 1, 2, and 3, as in the former the waste did not exceed 14.5 per cent. This is a striking illustration of the possible difference which may exist in the economy of management of the food supply of a family or boarding house.

The large waste of nutrients in the spring term is emphasized by the fact that the loss of fats was in greater proportion than that of other nutrients, thus involving a larger relative waste of food energy than is indicated by the percentages of organic matter. When the waste of organic matter was 17.2, 24, and 27 per cent, the corresponding waste of fuel value was 20, 26, and 32 per cent.

While the waste in the fall term is not as low as it might be under more favorable circumstances, it was not greater than frequently exists under boarding-house conditions, where there is not a concerted action on the part of the boarders toward economizing in all reasonable ways.

THE FOOD ACTUALLY EATEN.

In considering the results of these dietary studies, so far as it relates to food consumption the following facts pertaining to the conditions should be taken into account:

In the spring term the period of observation began during the cold weather of February and ended during the warm weather of June, and included a period during which there is usually a marked decrease of appetite.

In the fall term the conditions were reversed, and there was a gradual change to cold weather, which, other things being equal increases the appetite.

The supply of animal foods, and to some extent of vegetable foods, was purposely changed in passing from one period to another.

The nutrients consumed in these dietary studies are briefly summarized in the following table:

SUMMARY OF AMOUNTS AND FUEL VALUE OF NUTRIENTS CONSUMED.

	Protein.	Fats.	Carbohydrates.	Fuel value.
SPRING TERM.	Grams.	Grams.	Grams.	Calories
First dietary (No. 148): Usual food supply...	132	147	751	4,990
Second dietary (No. 149): Costly meats; milk limited	112	164	517	4,105
Third dietary (No. 150): Milk in abundance; other protein less costly.................. ..	112	106	530	3,620
FALL TERM.				
Fourth dietary (No. 151): Milk supply limited	131	181	579	4,595
Fifth dietary (No. 152): Milk supply unlimited	[illegible]	184	436	3,990
Voit's standard, man at moderate work	118	56	500	3,055
American standard (Atwater), man at moderate work	125	....	....	3,500

It will be noticed that the consumption of fats and carbohydrates was especially large, while the amount of protein was more nearly in accord with the so-called dietary standards.

The amount of nutrients consumed in the first dietary (from February 25 to April 24) is especially excessive, particularly in the case of the carbohydrates. While this may be explained in part by the uniformly keener appetites of the students at the beginning of a term, it was probably chiefly due to the abundant supply of maple sirup which was furnished during this period. The use of so much sirup involved a correspondingly large consumption of flour. Seventy-four grams of maple sirup and 358 grams of flour were consumed daily per man during the first dietary, whereas during the succeeding dietaries scarcely any sirup was eaten and only 281 grams of flour per day. There can be but little doubt that the free use of sirup on the table leads to an excessive proportion of carbohydrates in the dietary.

The marked decrease in the food consumption as the term progressed is probably accounted for by the gradual elevation of temperature and the changes in the physical condition of the students. The food consumption changed from a fuel value of about 5,000 calories in February, March, and April to less than 3,700 calories in May and June.

THE INFLUENCE OF THE SUPPLY OF ANIMAL FOODS UPON THE SIZE AND COST OF THE DIETARY, WITH ESPECIAL REFERENCE TO MILK.

As has been stated, the attempt was made in four dietary studies to deliberately control to some extent the supply of animal foods and the source of protein. The attempt was also made to determine the relative value of milk in the dietaries.

The following table briefly summarizes the amounts and kinds of food materials purchased in the four dietaries:

FOODS PURCHASED IN FOUR DIETARIES.

	Foods Purchased Daily Per Man.			
	Dietary 149: Milk limited, other protein high cost.	Dietary 150: Milk unlimited, other protein low cost.	Dietary 151: Milk limited.	Dietary 152: Milk unlimited.
Animal food:	Grams.	Grams.	Grams.	Grams.
Beef, veal and mutton	337	130	241	211
Pork, lard, etc.	76	172	114	132
Poultry	71	......	9	14
Fish, etc	89	69	61	54
Eggs	112	53	49	28
Butter	83	74	67	40
Milk	810	1,197	873	1,223
Mince meat	......	......	......	2
Total	1,611	1,695	1,414	1,704
Vegetable food:				
Cereals, sugars, etc	476	595	576	460
Vegetables	638	477	671	464
Fruits	80	121	243	202
Total	1,195	1,193	1,490	1,126
Total food	2,806	2,888	2,904	2,836

In the following table the results of the studies are shown in another form:

GROSS WEIGHTS OF FOOD PURCHASED PER MAN PER DAY.

	Milk.	Animal foods other than milk.	Vegetable foods.	Total foods.
	Grams.	Grams.	Grams.	Grams.
Dietary No. 149: Milk supply limited; high-cost protein	810	801	1,204	2,806
Dietary No. 150: Milk supply unlimited; lower-cost protein	1,197	498	1,203	2,888
Dietary No. 151: Milk supply limited	873	541	1,498	2,904
Dietary No. 152: Milk supply unlimited	1,223	481	1,126	2,836

The tables show very conclusively that the intention to materially modify the kind of animal foods in passing from dietary No. 149 to dietary No. 150 was carried out. The use of beef, veal, mutton, poultry, and eggs was greatly diminished and the consumption of pork and milk increased. The butter eaten was less in the latter period also. In dietaries Nos. 151 and 152 the character of the animal foods other than the milk did not differ greatly. The quantities of high-cost meats were less, but their place was not taken by low-cost meats.

The above figures leave no room for doubt that the free use of milk diminishes the consumption of other foods. In passing from dietary No. 149 to No. 150 the milk consumption per man increased from 810 grams daily to 1,197, and the use of other animal foods decreased from 801 grams to 498 grams, while the vegetable foods were eaten in about the same quantities in the two studies.

Essentially the same result follows in dietaries Nos. 151 and 152, where the milk eaten increased from 873 grams daily to 1,223, the consumption of other animal foods decreasing from 541 grams to 481, and of vegetable foods from 1,490 to 1,126 grams. In the first instance the milk replaced other animal foods, and in the second there was mainly a decrease in the use of vegetable foods. But while the increased consumption of milk diminished the consumption of other materials, what was the effect upon the actual quantity of nutrients taken and upon the cost of the dietary?

The answer to the question is very definite, and may be found in the following comparison of the results of the investigations:

COMPARISON OF NUTRIENTS EATEN.

	Nutrients per Day per Man.				
	Protein.	Fats.	Carbohydrates.	Total.	Cost.
Second dietary (No. 149): Milk limited:	Grams.	Grams.	Grams.	Grams.	Cents.
Animal foods	72	158	53	283	....
Vegetable foods	40	6	464	510	....
Total foods	112	164	517	793	34
Third dietary (No. 150): Milk unlimited:					
Animal foods	67	98	65	230	....
Vegetable foods	45	8	465	518	....
Total foods	112	106	530	748	26

COMPARISON OF NUTRIENTS EATEN—CONCLUDED.

	Nutrients Per Day Per Man.				
	Protein.	Fats.	Carbohydrates.	Total.	Cost.
Fourth dietary (No. 151): Milk limited:	Grams.	Grams.	Grams.	Grams.	Cents.
Animal foods.	79	....	45	....	....
Vegetable foods	52	....	534	....	....
Total foods	131	181	579	891	27
Fifth dietary (No. 152): Milk unlimited:					
Animal foods	83	....	64	....	....
Vegetable foods	37	....	372	....	....
Total foods	120	184	436	740	25

The results are stated in another form in the following table:

SUMMARY OF NUTRIENTS EATEN DAILY PER MAN.

	Protein.	Fat.	Carbohydrates.	Total.	Daily cost per man.
SPRING TERM.					
Second dietary (No. 149):	Grams.	Grams.	Grams.	Grams.	Cents.
Milk supply limited	112	164	517	793	34
Third dietary (No. 150):					
Milk supply unlimited	112	106	530	748	26
Difference, (increase +, decrease —)	....	—58	+13	—45	—8
FALL TERM.					
Fourth dietary (No. 151):					
Milk supply limited	131	181	579	891	27
Fifth dietary (No. 152):					
Milk supply unlimited	120	184	436	740	25
Difference (increase +, decrease —)	—11	+3	—143	—151	—2

It appears that instead of causing an increased consumption of nutrients, the freer use of milk was attended by a decrease of the nutrients eaten in the spring term amounting to 45 grams daily and in the fall term to 151 grams daily. In the spring term it might reasonably be urged that the coming of warm weather would have the effect noted, all other conditions remaining the same, but this cause certainly could not have been operative in the fall term, when milk was freely supplied, for cold weather came on, and this ordinarily causes a keener appetite. It is interesting to note that in the spring term the additional milk replaced other animal foods, while in the fall term it replaced vegetable foods. It is reasonable to regard this as to some extent a case of involuntary selection of foods, as with the advent of warm weather the tendency would be to reject animal foods, while the effect of cold weather would be the reverse.

The financial outcome is favorable to the free use of milk. Notwithstanding the largely increased waste, the cost per man per day in the third dietary is 8 cents less than in the second.

The total decrease in the cost of food during dietary No. 150 as compared with dietary No. 149 was about $4.50 per day. The saving should not be credited wholly to the increased supply of milk, because the other animal foods were in part of a less expensive kind.

The saving in dietary No. 152 was less, amounting to only 2 cents per day per man, or a total of $1.57 daily. This smaller saving is equal, however, to $416 for a school year of thirty-six weeks with the number of persons included in third dietary study. It should be noted that this saving was made in spite of the increased proportion of animal foods, an increase which, other conditions remaining unchanged, raises the cost of living.

If, as we have reason to believe, it be true that the average American dietary contains too large a proportion of non-nitrogenous compounds, then the free use of milk, besides cheapening the cost of living, accomplished another desirable result, viz., it raised the proportion of protein in the dietary, thereby making it more rational. The nutritive ratios of the dietaries with a limited supply of milk were 1:7.9 and 1:7.5, and of the dietaries where milk was freely used 1:6.7 and 1:6.8.

SUMMARY.

The main results of these dietary studies are briefly summarized with especial reference to their important practical relations to the economical purchase of human foods.

(1) The cost of the animal foods bought for the commons of the Maine State College during 209 days was 69 per cent. of the total food cost, varying in the different periods from 63.7 to 73.1 per cent. This shows very clearly the direction in which economy can most effectively be exercised in purchasing a food supply.

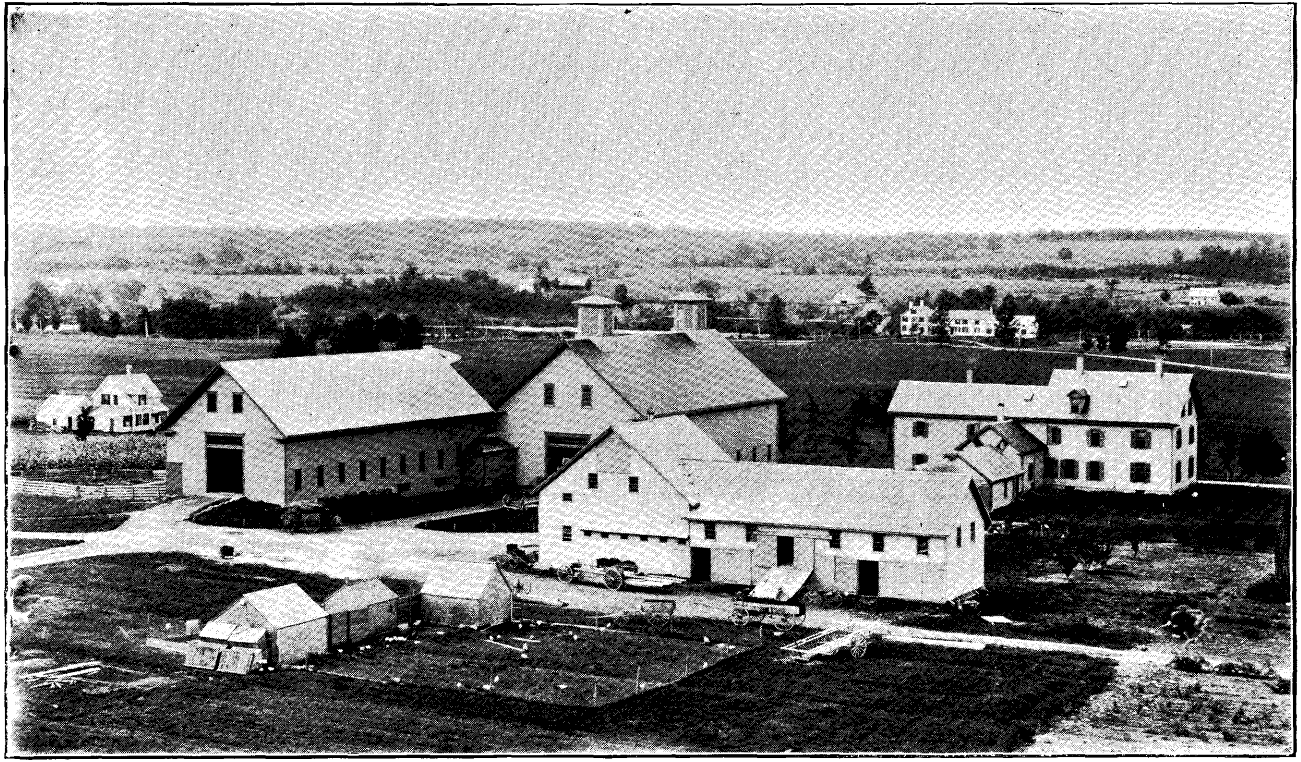
(2) The freer use of milk did not, as is supposed by some to be the case, increase the gross weight of food eaten. The extra amount of milk consumed replaced other animal foods to a nearly corresponding extent in the first trial and caused a proportionate diminution in the consumption of vegetable foods in the second study.

(3) The actual quantity of water-free nutrients eaten diminished rather than increased when more milk was supplied. This is in marked contrast to the apparent effect of the free use of maple sirup, which was accompanied by a notably large consumption of nutrients.

(4) In both trials the increased consumption of milk had the effect of materially narrowing the nutritive ratio of the dietary, a result which, in view of the recognized tendency of Americans to consume an undue proportion of fats and carbohydrates, appears to be generally desirable.

(5) The dietaries in which milk was more abundantly supplied were somewhat less costly than the others and at the same time were fully as acceptable.

(6) These results indicate that milk should not be regarded as a luxury, but as an economical article of diet, which families of moderate income may freely purchase as a probable means of improving the character of the dietary and of cheapening the cost of their supply of animal foods.



STATION FARM BUILDINGS.

BULLETIN No. 23.

PRESERVATION OF CREAM FOR MARKET.

F. L. RUSSELL.

It is an important feature of our dairy business that there is a growing demand for fresh sweet cream, not only for domestic use, but for exporting to the large cities. During the past year this cream trade from Maine has considerably exceeded $150,000 and each year finds the demand increasing. It has come to be an important question how best to foster this branch of our dairy business, and during that season when butter is most abundant and cheapest—for there is the greatest demand for cream during the summer months—to find a profitable market for this commodity and so reduce the butter supply and at the same time increase the profit from the dairy. One important reason for fostering the cream trade is that cream sold to be consumed as cream is in no large degree a rival of either milk or butter, but enlarges the demand for dairy products at a time when such products are most abundant and most cheaply produced.

The only obstacle in the way of this trade that has retarded its development is the perishable nature of cream. While it is but little more perishable than milk, it is in a sense a manufactured product and subject to delays in the process of manufacture before it can find its way to market. This difficulty is in a measure overcome by the perfecting of cream separators which quickly condense the cream from the milk without any long delay or opportunity for change, or by what is often found to be a more practical way, the cream obtained from the milk by the deep cold setting process is condensed by the separator while it is yet sweet and comparatively fresh.

One reason why there has been more risk in handling cream than milk is the greater value of the cream, involving greater loss when it fails to reach the market in good condition.

As is very generally known at the present time, the souring of cream is due to the growth of minute organisms or plants called bacteria. These bacteria are not present in the milk while it is yet in the udder of the cow, but they are so universally distributed, especially in warm weather, about the barns and in the dust of the air, that the milk has scarcely reached the pail on its way from the udder of the cow before it is contaminated with them. Under favorable conditions for their growth they will cause the milk or cream separated from it to sour and no ordinary straining or even passing the milk through a cream separator will remove them. After the bacteria that cause souring of milk and cream are once introduced, they will multiply rapidly and soon do their work unless they are destroyed or held in check, that is, their growth and multiplying prevented.

METHODS OF DESTROYING THE GERMS.

There seem to be but three methods of preventing this growth and consequent souring of the cream: First, by means of cold; second, addition to the milk or cream of some germicide like boric or salicylic acid; or third, by subjecting the cream to a sufficiently high temperature to destroy the germs. Each of these methods has its advantages and disadvantages when put to practical use, and it is the purpose of this bulletin to show which of them has the most to recommend it.

USE OF COLD.

In this climate during steady cold weather there can be but little objection to the use of cold as a preservative in shipping cream to local markets. Cream that is kept at a temperature below 45 F. will remain sweet for a long time, but in warm weather and when it has to be shipped to a distant point in warm cars, the necessary cold is secured by the use of ice, which is an unsatisfactory method on account of expense, although the quality of the cream brought to market by this method is of the highest.

USE OF GERMICIDES.

The method of adding something to the cream that will destroy the bacteria or prevent their growth, no matter how warm the weather or how distant the market, appeals to the dealer on account of its cheapness, simplicity and effectiveness. Cream in which a sufficient quantity of boric acid or salicylic acid has been introduced, for these are the substances generally used as preservatives of cream, will remain perfectly sweet for an indefinite time even in the hottest summer temperature. These chemicals produce no decided change in the taste or appearance of the cream, and it is no wonder that this method has sometimes been adopted by those who have seen in it a solution of the only difficulty in the way of extending a lucrative cream trade. What, then, are the objections to this method? The first and the very decided objection that will occur to the consumer is, that when paying for sweet and wholesome cream he does not want it diluted with anything else. In view of the comparatively small quantity of the preservative that has to be used, this objection might be overcome by an appeal to the reason of the consumer, if he did not have reason as well as prejudice on his side. If it could be shown that the preservative was as harmless as the cream itself there would, perhaps, be no reasonable objection to it, but the best that can be claimed for these chemical preservatives is, that while they are sure death to bacteria they also endanger the health and derange the digestive apparatus of human beings. Among those qualified to judge of the effect of these substances when taken into the stomach of human beings, there is practically but one opinion, and that is, that the constant consumption of them is harmful even if taken in small quantities. In certain cases where persons are suffering from disease of the digestive organisms, the use of cream preserved by this method is positively dangerous.

The statement is made by Foraster and quoted in the National Dispensatory that boric acid greatly increases the fecal solids and the excretion of albuminous compounds,even when given in a daily dose of seven or eight grains, and that these effects continue for some time after the suppression of the medicine.

The United States dispensatory says that the practice of using salicylic acid for a preservative of articles of food is to be condemned. A commission appointed by the French government reported that the prolonged use of even a very small amount of salicylic acid is dangerous, especially to very aged persons.

It is not difficult to see that it will be fatal to the permanent interests of the cream trade if dependence is placed upon chemical preservatives to keep the cream sweet. Such a practice is quite easily detected by chemical tests and a well founded suspicion that it is commonly resorted to can only work injury to the trade, even in cream preserved by unobjectionable methods.

USE OF HEAT.—PASTEURIZATION.

The third method for keeping cream sweet until it reaches the consumer, namely, by the use of heat, is based upon the fact that bacteria that cause souring of cream are destroyed at a temperature which leaves the cream uninjured. By practical tests it has been found that a temperature of 155 deg. F. continued for ten minutes will destroy nearly all of the souring organisms without seriously injuring the appearance and without perceptibly affecting the taste or wholesomeness of the cream. This method is termed "pasteurization." While pasteurization may not destroy all bacteria that are sometimes found in cream, so that there is no possibility that souring will take place afterwards, it does destroy most of them, and if cream so treated is at once placed in sterilized cans with proper precautions to guard against introducing any more germs, it has been found in practice that it can be shipped to distant markets under all conditions of weather and reach the consumer in a perfectly sweet condition. Pasteurized cream has been successfully shipped from Wisconsin to Maine and California and intermediate points with perfect success.

Perhaps the chief objection that can be urged against this method is the fact that after being heated to 155 deg. F. the cream never seems quite as thick as before, but this is an objection that has little weight when the true cause is known. The taste and appearance, aside from thinness, is like that of fresh cream.

To pasteurize cream it is only necessary to quickly warm it to 155° F., allow it to remain at this temperature for ten minutes and then cool it as quickly as possible. To do this rapidly on a commercial scale requires specially devised apparatus, several forms of which are already on the market. It will be seen that this method involves slightly more trouble and expense than that of preserving with chemicals, but it seems to us that it is the only practical method that is not open to very serious objections and it renders possible a large and permanent extension of what is already a considerable business in this State, and it will without doubt pay the dealers in this commodity to look well into the advantages of this method over any other at their command.

It may not be out of place in this connection to state that the Maine Experiment Station has ordered a pasteurizing apparatus of an improved pattern, which can be seen here a little later by those interested in the cream trade. We intend to carefully investigate the effectiveness of the apparatus and, if it meets with our expectations, we shall be inclined to urge upon the creamery men of the State the advisability of the pasteurizing method of preserving cream in place of the more expensive or otherwise objectionable methods that have formerly been used.

MAINE STATE COLLEGE, Orono, Me., Feb. 24, 1896.

BULLETIN No. 24.

CABBAGES.

H. P. GOULD.

The purpose of this bulletin is to give a concise account of our experience with cabbages during the past season, with a brief discussion of the evidence presented.

The seed was sown April 1st, and the seedlings pricked out into seed-flats April 27th, and set in the field May 25th. The season being exceptionally dry, all of the plants made a weak growth and correspondingly small heads.

1. *Influence of size of seed:*—The idea has been advanced that it is the tendency of plants from large seeds to run to leaves at

the expense of the head, while the tendency of plants from small seeds is to run to head. In order to study the influence of the size of seed on the relative size of the head, fifty of the largest seeds, also fifty of the smallest were selected from each of three varieties. Of two of the varieties, the weight of the smaller seeds was less than half that of the larger; the weight of the smaller seeds of the other variety was a little more than half that of the larger. Each lot of fifty seeds was sowed, and when the plantlets were ready for the first handling, twenty of the best plants from each lot were selected and handled as above stated.

Table I gives the ratio of the average weight of the heads from the small seed to that of the heads from the large seed.

TABLE I.

	Ballhead.	Reynolds' Early.	Harvest Home.
Large seed	1.69	1.37	.94
Small seed	1.00	1.00	1.00

The facts are too obvious to need extended explanation. The large seed of two of the varieties, Ballhead and Reynolds' Early, produced heads which averaged 69 per cent. and 37 per cent. larger respectively, than did those from the small seed. The other variety—Harvest Home—gave contradictory results, the heads from the small seed averaging 6 per cent. heavier than those from the large seed.

2. *Results of tying up the outer leaves:*—It has been thought by some one that by drawing the leaves of the cabbage together and binding them with a string over the head, maturity would be hastened. Accordingly, with this idea in mind, as soon as the heads had fairly commenced to form, three lots of plants were treated in the way described above, i. e., the points of the leaves were drawn together over the head and a string tied around them sufficiently tight to keep them in the desired position. The results obtained relative to the point in question cannot well be expressed by figures, but suffice it to say that the operation seemed to have no influence whatever upon the date of maturity. This treatment, however, was not without its effect, as the figures in table II will show.

TABLE II.

	Harvest Home.	Surehead.	Reynolds' Early.
Outer leaves tied up	.44	.46	.67
Check	1.00	1.00	1.00

Representing the weight of an average head from the check plants by 1 or 100 per cent., an average head from the Harvest Home which received the special treatment, would be represented by 44 per cent. In the same manner, we observe that the heads from the treated plants of Surehead were only 46 per cent. as heavy as the untreated, and Reynolds' Early, 67 per cent. In a word, the size of the heads from the treated plants averaged from 33 per cent. to 56 per cent. by weight smaller than did those from the untreated plants.

Another result of this operation which was even more noticeable than the decreased size of the heads, was the effect upon quality. Although all possible care was taken in tying up the leaves, they did not overlap sufficiently to keep out all moisture, so that during rains a considerable amount of water entered each head. This moisture being so inclosed within the leaves, did not readily evaporate. As a result of this continued dampness, the inner portions of the plants very soon began to decay; it was not long before this effect became noticeable upon the outer leaves, resulting in a large proportion of the leaves falling off long before the season of growth would otherwise have ceased. As a result of this decay, not a single head was produced fit for home use, to say nothing about its marketable qualities.

3. *Effect of Mulching:*—The advisability of using straw or some similar material as a mulch for the purpose of conserving the soil moisture has often been discussed. In order to ascertain the advantages, if any, of such treatment in the culture of the cabbage, three lots of plants, as soon as they were fairly started after being set in the field, were thoroughly mulched with swale hay so that when packed down the mulch was two or three inches thick, the space between the rows of plants being

completely covered. Three lots of plants, corresponding to those mulched, received frequent cultivation. So far as the maturity of the heads was concerned or the per cent. of plants forming heads, the mulching seemed to have no appreciable effect. There was a slight increase in the size of the heads favoring the use of the mulch, as shown in the following table:

TABLE III.

	Lupton.	Surehead.	Harvest Home.
Mulched	1.00	1.07	1.13
Cultivated	1.00	1.00	1.00

The differences are not sufficient to be very conclusive. It will be noticed that there was no difference in the case of the Lupton between the average weights of the heads from the two lots, while the average weights of the other two varieties were only 7 per cent. and 13 per cent. in favor of the plants which were mulched. These differences are so small that we would not feel justified in making too strong claims for the advantages of mulching, as the variations might result from some other causes, yet we may infer from the indications that a mulch can be applied to advantage, especially in a dry season.

4. *Shallow vs. Deep Cultivation:*—It has been our practice in the cultivation of the cabbage, as in that of nearly all vegetables, to use the horse-cultivator with much freedom, running the cultivator as close to the plants as possible without disturbing them. This, oftentimes, becomes in effect a method of root pruning, giving rise to the question,—Does deep cultivation affect the heading of the plants? For the purpose of ascertaining, if possible, the effect of such treatment, four lots of plants were cultivated as described above, while four similar lots were given only such cultivation as could readily be furnished with a common hoe. The various lots of plants were all cultivated with the same frequency, the only difference being the depth to which the soil was stirred. The following table gives the comparative results:

TABLE IV.

Variety and Treatment.	Per cent of immature heads.	Ratio of average weight per head.
Surehead:		
Shallow cultivation	10.5	1.16
Deep cultivation	.6	1.00
One-hundred Weight:		
Shallow cultivation	11.1	1.12
Deep cultivation	.0	1.00
Lupton:		
Shallow cultivation	5.3	.93
Deep cultivation	12.5	1.00
Harvest Home:		
Shallow cultivation	52.6	.72
Deep cultivation	5.0	1.00

The effects as expressed by the above figures are somewhat contradictory. In the case of all but one of the varieties, Lupton being the exception, a larger percentage of the heads from plants which received shallow cultivation were immature at the time when most of the heads were ready for cutting, than from those receiving deep cultivation, the difference varying from about 10 per cent. to over 47 per cent. It seems probable that the deep cultivation which gave to the plants a heavier mulch of finely pulverized soil than that given to the plants receiving the shallow cultivation, so aided in the conservation of the moisture that the plants were able to make a more vigorous growth, and to form more perfect and uniform heads. No specific conclusion can be drawn from a comparison of the average weights, as two of the varieties gave results favoring deep cultivation, while two were against the practice, though the greater difference was in favor of deep cultivation.

RECAPITULATION.

1. The size of the seed seems to have some influence upon the size of the head, the larger seed, as a rule, producing the larger head.

2. The tying up of the outer leaves seems to have no influence upon the maturity of the heads, while it produces a marked decrease in the size and almost invariably causes the head to decay.

3. Mulching with straw or some similar material in a dry season tends to increase the size of the head.

4. Deep cultivation seems to have little if any effect upon the size of the head, but plants so treated appeared to mature more uniformily than plants receiving shallow cultivation.

MAINE STATE COLLEGE,
ORONO, ME., March 1, 1896.

BULLETIN No. 25.

INSPECTON OF FERTILIZERS, 1896.

The bulletin gave the manufacturer's guarantees and the analyses of manufacturer's samples, but as these figures are of only passing value they are omitted here.

BULLETIN No. 26.

INSPECTION OF GLASSWARE USED BY CREAMERIES AND BUTTER FACTORIES TO DETERMINE THE VALUE OF CREAM AND MILK.

J. M. BARTLETT.

Ever since the introduction of the Babcock test for estimating the value of cream or milk at creameries and butter factories, more or less dissatisfaction and in some cases distrust, have prevailed among a few patrons to whom payment has been made on this basis. These complaints have come in various forms. Some creameries have been accused of using incorrectly graduated glassware, pipettes that were too small, thereby making the test too low; others of employing incompetent men to manipulate the test.

In order to remedy such evils if they existed and restore confidence to the minds of the patrons, a law was enacted by the Maine Legislature of 1895, entitled "An act for the Protection of Dairymen," which appears as Chap. 169 of the laws of 1895. Without giving the full text of this law, there is stated below a summary of its principal provisions and requirements.

Section 1. This section requires that every individual or corporation buying milk or cream or apportioning its value on the basis of the fat content shall have all the bottles and pipettes tested for accuracy, which are used in determining the per cent. of fat, and each of these bottles and pipettes shall bear a mark showing that it has been so tested.

Sec. 2. In this section it is made the duty of the Director of the Maine Experiment Station or some person he may designate to execute the provisions of Section 1. The actual expense of this work shall be paid by the persons or corporations for whom it is done.

Sec. 3. This section requires that any person operating the Babcock or other tests for determining the fat in milk or cream which is to be purchased or its value apportioned, must possess a certificate of competency for such work. This certificate is to be issued by the Superintendent of the State College Dairy School in accordance with such rules and regulations as he may devise.

Sec. 4. No one is allowed to use at any creamery, butter factory, cheese factory or condensed milk factory where milk or cream is bought or its value apportioned, or to have in his possession with intent to use, any sulphuric acid of less than one and eighty-two hundredths specific gravity. This section also provides penalties for the violation of the provisions of this act.

Sec. 5. This section fixed the date on which this law shall take effect which is six months from the day of approval, or September 27, 1895.

Early in the spring of 1895 a circular letter was sent to each creamery with which was enclosed a copy of the law giving notice that the Station would be ready to test all glassware after June 1. The examination of candidates and issuing of certificates of competency for making the test was conducted by Professor G. M. Gowell, superintendent of the dairy school, and the work of testing the glassware was delegated to the writer.

METHOD OF MAKING THE TEST.

For this purpose we had made an accurately graduated burette of the same diameter and marked the same as the necks of the cream bottles. The bottle to be tested is filled to the zero mark with mercury as is also the burette. Then the mercury is allowed to run slowly from the burette into the bottle until the upper line of the mercury stands at the 5 per cent. mark on the burette. The mark at which the upper line of the mercury stands in the neck of the bottle is also noted and if it coincides with the 5 per cent. mark, the graduation is correct. Another portion is now run in until the 10 per cent. mark on the burette is reached and so on until the 25 per cent. mark is reached. Slight errors like one or two-tenths of 1 per cent. have been passed unnoticed, but when there was an error of three-tenths or more, the bottles have been thrown out, not because three-tenths in practice is a serious error, but because it is better to insist that manufacturers shall furnish goods up to their guarantee.

For testing pipettes, an accurately graduated standard pipette is used. It is filled with mercury and then the contents are emptied into the pipette to be tested. If the point reached by the mercury coincides with the mark on the standard pipette, it is of course correct. All bottles and pipettes tested and found correct have been marked with the letters O. K., while those that are not correct are marked "off."

Only about one-half of the creameries of the State have sent their glassware to us, which indicates one of three things: (1) That those who have not responded are not using the test; (2) that they have obtained tested glassware from dealers, or (3) they have not complied with the law. In all, 1,498 cream bottles, 210 milk bottles and 96 pipettes were received prior to January 1st. Thirty-nine of the cream bottles were found to be more inaccurate than the prescribed limit, three-tenths of one per cent. and were consequently thrown out. Twenty-four of the number, however, were found in two small lots which evidently came from some unreliable manufacturer, as the error found was greater in those, in some cases over one-half of one per cent., than in any other lots. Of the 210 milk bottles all were correct, excepting 33 of one lot of 60. The errors in these bottles varied from three-tenths to one per cent. The source of these bottles could not be learned as they were found at the creamery when the parties now occupying it took possession. They were evidently made by some unreliable firm.

The glassware as a whole, however, has been very satisfactory and the new goods received from the manufacturers since the above act went into force have been exceptionally accurate, showing that the law has had the desired effect. No intentional fraud has been detected, the discrepancies discovered evidently being due to errors in graduating.

The law, although in most cases seeming unnecessary, cannot help being beneficial to all parties using the test, as it will eventually exclude the goods of unreliable manufacturers from the State, and will tend to increase confidence in the accuracy of the method upon which are based the payments for milk and cream.

The following is a list of the parties and creameries who have sent us their glassware to be tested:

E. E. Light, Union, Me.
West Paris Creamery, West Paris, Me.
Bethel Dairy, Bethel, Me.
Bridgton Creamery, Bridgton, Me.
W. L. Phillips, East Wilton, Me.
Forest City Creamery, Portland, Me.
Hillside Creamery, Exeter, Me.
A. L. & E. F. Goss Co., Lewiston, Me.
Turner Centre Creamery, Auburn, Me.
New Gloucester Creamery, New Gloucester, Me.
Wonder Brook Creamery, Kennebunk, Me.
John C. Gordon, Ellsworth, Me.
G. F. Gerry, Garland, Me.
Solon Creamery, Solon, Me.
Poland Dairy Association, Poland, Me.
I. O. Winslow, St. Albans, Me.
C. A. Whitney, Norridgewock, Me.
Bangor Creamery, Bangor, Me.
C. C. Nichols, Foxcroft, Me.
E. S. Dixon, Sabbatus, Me.
J. M. Tukey, New Castle, Me.
———Smith, Hampden, Me.
East Pittston Creamery, East Pittston, Me.

MAINE STATE COLLEGE,
ORONO, ME., March 25, 1896.

BULLETIN No. 27.

PEAS—SWEET CORN.

H. P. Gould.

PEAS.

It is a well known fact that nearly all of the earliest varieties of peas are what are commonly known as "smooth" or "hard" peas; the poor quality of this type is equally well known. One of the aims of the introducer has been to secure a sort which should possess the qualities of the later or "wrinkled" varieties and at the same time be as early as the smooth varieties. Efforts in this direction have been at least partially rewarded with success. There have been put upon the market during the past few years several varieties of the wrinkled type which are of excellent quality and also very early.

The purpose of this article is to call attention to a few of the newer varieties of peas which have given good satisfaction as grown in the station gardens.

Our usual rate of seeding has been one quart of seeds to 100 feet of drill, though it is probable that one quart to 75 or 80 feet of drill may be a more profitable rate.

The following descriptions are of "wrinkled" varieties of recent introduction which can be recommended for general cultivation.

Station, (Gregory):—Of moderately vigorous growth; 5 to 6 peas to the pod; quality good; maturing in from 45 to 55 days.

Morning Star, (Childs):—Growth somewhat less vigorous than Station; 5 to 6 peas to the pod; quality excellent; reaches edible maturity in 45 to 55 days.

Exonian, (Thorburn & Co.):—Vines medium height but very small; foliage noticeably light colored; about 6 peas to the pod; maturing in from 50 to 60 days.

Early Woodside, (H. N. Smith):—Of rather dwarf habit; 6 peas to the pod; quality good; from 60 to 70 days required to reach edible maturity.

Climax, (Northrup, Braslan & Goodwin Co.):—A very tall variety with rather small vines; one of the most prolific; quality not of the best; matures in about 70 days.

Echo, (Burpee):—A moderately vigorous grower; 7 peas to the pod; matures in from 65 to 75 days.

Renown, (Burpee):—Of rather dwarf habit; prolific; season medium to late.

Nott's Excelsior, (Maule):—A dwarf sort about 1 foot in height; 5 or 6 peas to the pod; matures in 50 to 55 days. Has received many favorable comments during the past 4 or 5 years.

The above are only a few of the many sorts which might be mentioned in the connection of "new varieties" but to increase the list would be doubtless to increase the indecision if one were selecting varieties for planting.

In our comparison of varieties such well known sorts as American Wonder, Heroine, Stratagem, Telephone, Abundance, and several others of like reputation have been taken as the standard of excellence.

Of the smooth peas, we will simply make mention of the following varieties: Maud S., Sunol, Summit, Rural New Yorker, Alaska, Daniel O'Rourke Improved. These varieties have no marked distinctive characteristics aside from the type and their chief value lies in the earliness of maturity.

It will be observed that in the foregoing descriptions considerable latitude is given for the time required by the different varieties to reach edible maturity. This wide variation is given from the fact the season has considerable influence upon the time required to reach edible maturity, the number of days being less in a warm than in a cold season. The same difference is noticeable in the time required for the maturity of early and late sowed peas of the same variety.

SWEET CORN.

Although corn has received no special attention at this station, several varieties have been grown each year and a few notes taken concerning their behavior.

Every one who is at all familiar with the catalogue of the average seedman is equally familiar with the high sounding and attractive description of varieties which most catalogues contain. We do not wish to infer that such descriptions are given for the purpose of deceiving, yet the fact remains that if one bases his anticipations on the descriptions which he finds, he is more than likely doomed to disappointment at the results which he obtains. While this condition of things does not exist in regard to the descriptions of corn to the extent that it does in regard to many other things, yet not a few of the statements are misleading. Especially have we found this to be true as to statements concerning the date of maturity. Very often varieties described as "early" have proven so late as to be almost worthless, and several so called medium sorts have failed to mature at all. A plausible excuse may appear, however, for this apparent deception when we consider the fact that practically all of the seeds disseminated by the larger seed companies are produced in a climate where the growing season is considerably longer than in Maine.

The following table represents most concisely the more important points relative to the varieties grown the past season:

Variety.	Source of Seed.	Date of first appearance of tassels.	Date of first appearance of silks.	Date of edible maturity.	Number days from planting to date of maturity.	Average length of ears—inches.	Average height of stalks—feet.
Best of All	H. W. Buckbee	July 24	Aug. 1	Sept. 2.	95	....	7.0
Cory (White)	J. M. Thorburn & Co	July 12	July 24	Aug. 17.	79	6.0	4.5
Crosby's Early	J. M. Thorburn & Co	July 20	Aug. 5	Sept. 2.	95	...	6.0
Early Dawn	Johnson & Stokes	July 24	Aug. 7	Sept. 7.	100	7.5	6.5
Early Sweet	D. M. Ferry & Co	July 24	Aug. 7	Sept. 11.	104	9.0	7.5
Early Sunrise	Iowa Seed Company	July 12	July 26	Aug. 17.	79	7.0	6.0
Early Vermont	A. W. Livingston's Sons,	July 12	July 26	Aug. 24.	86	....	4.0
Eastman's Early	Eastman Seed Company	July 12	July 26	Aug. 17.	79	...	4.0
Hance's Early	A. W. Livingston's Sons,	July 24	Aug. 10	Sept. 11.	104	7.5	6.5
Henderson Sugar	Peter Henderson & Co.	July 24	Aug. 7	Sept. 7.	100	9.0	8.0
Hickox Hybrid	D. M. Ferry & Co	July 17	Aug. 7	Sept. 7.	100	9.0	7.0
Honey	Johnson & Stokes	July 24	Aug. 10	Sept. 7.	100	8.0	8.0
Lackey's Early Sweet	J. J. H. Gregory & Son	July 12	July 26	Aug. 17.	79	6.0	5.0
New England	D. M. Ferry & Co	July 15	Aug. 1	Aug. 31.	93	7.0	6.0
Perry's Hybrid	J. M. Thorburn & Co	July 20	Aug. 5	Sept. 7.	100	8.0	6.5
Quincy Market	J. J. H. Gregory & Co	July 15	July 30	Aug. 26.	88	....	5.0
Shaker's Early	A. W. Livingston's Sons,	July 24	Aug. 8	Sept. 11.	104	8.0	6.5
Stabler's Early	J. J. H. Gregory & Son	July 29	....	Sept. 11.	104	8.0	7.5
Melrose	J. M. Thorburn & Co	July 26	Aug. 7	Sept. 5.	98	....	5.0
XX Sugar	W. H. Maule	July 24	Aug. 7	Sept. 11.	104	7.0	5.5
Livingston's Evergreen	A. W. Livingston's Sons,	July 24	Aug. 10	Sept. 15.	108	9.0	7.5
Acme Evergreen	Iowa Seed Company	July 29	Aug. 19	Did not reach edible maturity.	....	....	7.0
Burlington Hybrid	A. W. Livingston's Sons,	July 29	Aug. 7		....	....	7.0
Country Gentleman,	Johnson & Stokes	July 30	Aug. 17		....	....	7.0
Early Large Eight-rowed	A. W. Livingston's Sons.	July 27	Aug. 10		...	....	8.0

The varieties named above were all planted the last of May. The first killing frost was about the middle of September, so that in addition to the varieties which failed to reach edible maturity those which matured on or after September 11, of which there were several, were of but very little value for table use, as the date of edible maturity given in column five refers to the day on which the first ear was found which had reached an edible condition; this date, in most cases, was several days before enough ears could be picked to test the varieties.

For several years past the Cory has been the standard of earliness, but in quality it is far from perfection. As may be observed by referring to the table, several varieties were grown the past season which came to edible maturity on the same date as Cory—79 days from date of planting. The variety—Early

Sunrise—seems worthy of special mention. The quality compares very favorably with that of most later varieties and it was the most prolific variety grown.

Of the varieties which failed to reach edible maturity, we would call attention to the Country Gentleman, from the fact that since its introduction several years ago, no variety has received more favorable comment than this one, but for this State it is of little value on account of its lateness. It may mature under the most favorable conditions although it has been grown here for the past three years and in no case has it reached an edible condition before frosts, when given ordinary field culture.

For the benefit of those who may desire to purchase seeds direct of seedsmen the addresses of the seed merchants referred to in the above table are given herewith: J. M. Thorburn & Co., 15 John St., New York; Johnson & Stokes, Philadelphia, Pa.; D. M. Ferry & Co., Detroit, Mich.; A. W. Livingston's Sons, Columbus, Ohio; J. J. H. Gregory & Son, Marblehead, Mass.; Peter Henderson & Co., 35 and 37 Cortland St., New York; Iowa Seed Co., DesMoines, Iowa; Eastman Seed Co., East Sumner, Maine; Wm. Henry Maule, Philadelphia, Pa.; H. W. Buckbee, Rockford, Ill.

MAINE STATE COLLEGE,
ORONO, ME., March 18, 1896.

BULLETIN No. 28.

POTATO ROT—BORDEAUX MIXTURE AND FUNGIROID AS PREVENTIVES.

H. P. GOULD.

Potato rot or "late blight" as it is frequently called, is a common and at the same time, one of the most serious diseases of the potato. It is the result of the growth and development of a fungous plant within the tissues of the leaves and tubers. The first indication of the presence of the fungus is the browning of distinct areas upon the leaves; a portion of the leaf may be affected or the whole leaf may be involved. If the weather is warm and moist the disease usually spreads with great rapidity, a whole field assuming a brownish or blackened appearance within a few days from the first evidence of the presence of the malady; or if the weather is cool or dry, it may be difficult to distinguish the effect of the fungus from the natural maturing and dying of the foliage.

Early potatoes are seldom if ever injured, as the disease does not make its appearance until July or August.

Just how the tubers become infected is not known. The spores form on the under side of the leaves and fall to the ground. It is probable that these spores are washed by rains into the soil where they come in contact with the tubers and gaining entrance cause the well-known dry rot. It is possible that the mycelium of the fungus descends the stems and enters the tubers in that way, though the former manner of contamination is considered the more probable.

The injury due to the effects of the fungus may result from two causes. If the tops of the late potatoes are killed in July or August, the tubers will remain very small, even though they do not decay; but this latter condition almost invariably accompanies the dying of the tops, (if the dying be due to this fungus,) and when such is the case, the loss due to decay is usually much greater than from the former cause.

Although the direct effect of the disease on the tubers is to produce a dry rot, yet this unhealthy condition of the potato may often induce a "wet rot" which is especially noticeable at the time of digging.

If the weather is such that the fungus is developing rapidly, a very disagreeable and characteristic odor can usually be detected.

This subject has received much attention from experimenters during the past few years and some striking results have been obtained, proving almost beyond a doubt that the disease can be held in check if not absolutely prevented. Bordeaux mixture has invariably given the best results as a preventive of the malady.

By the use of Bordeaux mixture, at the Vermont Experiment Station, the total product in 1892 was increased from the rate of 169 bushels per acre from an unsprayed plat, to 400 bushels from a sprayed plat; at the Rhode Island Station, in 1890 the increase was 48 per cent., and several other stations report very favorable results.

Quite recently there has been put upon the market a fungicide known commercially as "fungiroid." This article is manufactured by Leggett & Brother, New York, and is said by them to be a powdered Bordeaux mixture and a substitute for that fungicide as ordinarily prepared. So far as I am aware, its qualities have not been thoroughly tested. If fungiroid should prove to be equally as effective as Bordeaux mixture, its advantage over the latter would be its ease of application. This applies especially in the treatment of low-growing plants.

During the past season the subject was given some consideration at this station. There were eighteen rows in the plat used for this work. The first row was sprayed with Bordeaux mixture; fungiroid was applied to the second, while the third was left untreated to serve as a check,—and so on throughout the plat—every third row in order receiving the treatment described above, making six rows sprayed with Bordeaux mixture, six treated with fungiroid and an equal number which received no treatment.

The first application of fungicides was made July 13; two other applications were subsequently made at intervals of about two weeks.

The following table gives a summary of each of the six rows:

BORDEAUX MIXTURE VS. FUNGIROID.

Treatment.	Total weight —pounds.	Ratio of yield.	Weight of decayed tubers —pounds.	Per cent. of decayed tubers.
Bordeaux	262¾	1.00	1.1	.4
Fungiroid	219	.83	18.7	8.5
Check	198¾	.75	20.3	10.2

Referring to the column, "ratio of yield," it will be observed that the total yield of the untreated rows was only 75 per cent. that of the rows sprayed with Bordeaux mixture, or an increase of 25 per cent. from the use of the Bordeaux; the total yield from the rows treated with fungiroid was 83 per cent. that of the rows sprayed with Bordeaux, or an increase of 17 per cent. in favor of Bordeaux mixture over fungiroid.

The last column gives the per cent. of decayed tubers. The rows sprayed with Bordeaux mixture produced only .4 of 1 per cent. by weight of decayed tubers, while from the unsprayed rows over 10 per cent. by weight of the tubers was decayed. The fungiroid seemed to have but little effect in preventing the decay.

The results do not promise the future for the fungiroid which had been hoped for it, yet we do not wish to draw final conclusions from this one season's trial.

In spraying potatoes for the prevention of the "blight," the first application should be made sometime from the first to the middle of July and subsequent applications should be made at intervals of from ten days to three weeks, depending upon the weather, rainy weather requiring more frequent applications than dry.

If potato bugs are numerous, Paris green may be added to the Bordeaux mixture at the rate of 1 ℔. to 150 gallons of the mixture.

The directions for preparing Bordeaux mixture given in the annual report of the Maine Experiment Station for 1889, may be varied somewhat. The following formula is the one most commonly used: 6 ℔s. copper sulphate, 4 ℔s. fresh unslaked lime, 45 gallons water. Dissolve the copper sulphate in a small quantity of water; slake the lime, adding a few quarts of water after the lime is slaked, and when cool mix with the copper sulphate solution and dilute with enough water to make in all 45 gallons. It is advisable to strain the lime solution before adding to the copper sulphate, as it usually contains more or less coarse material which would clog the spraying apparatus.

The copper sulphate should not be dissolved, nor should the Bordeaux mixture be prepared, in an iron vessel, as the copper compound will act upon the iron.

RECAPITULATION.

Potato rot, late blight or rust, as the disease is variously called, is the result of a fungous parasite; this disease can be held in check if not entirely prevented by the use of fungicides of which

Bordeaux mixture is the most satisfactory. The first application should be made early in July, followed by a second, after a lapse of from ten days to three weeks, according to the weather. Three or four applications should be made.

MAINE STATE COLLEGE,
ORONO, ME., March 31, 1896.

BULLETIN No. 29.

NOTES ON SPRAYING.

W. M. MUNSON.

The fact that insect and fungous enemies of the orchard may be held in check by careful attention to spraying with certain materials, has been so often and so plainly demonstrated that further proof seems unnecessary. By our more progressive farmers the practice is now looked upon as a necessity in successful orchard management, and there are frequent requests for information. To meet these inquiries, and to again call the matter to the attention of others, a brief review of the subject seems desirable at this time. Some points will be more fully discussed in the annual report for the current year.

Preparation for the Work:—If not already attended to, the necessary pumps and nozzles should at once be secured; likewise the chemicals—except the lime for Bordeaux mixture, which should be fresh when used. If a pump is already at hand it should be examined and the packing of the valves should be renewed. Be sure also that the hose is in good condition, as otherwise much valuable time may be lost later in the season.

It is advisable at this time also to prepare the necessary wagon or cart for use when spraying. In low-headed orchards an ordinary stone-boat or low wagon may serve the purpose well.

What is the best pump?—There are so many good pumps on the market at present it is not easy to give a specific answer to the question. The "Eclipse" made by Morrill & Morley, Benton Arbor, Mich., is highly recommended by some, but personally I have not used this form. The Field Force Pump Company, Lockport, N. Y.; The Goulds Manufacturing Company, Seneca Falls, N. Y.; The Deming Company, Salem, Ohio; W. & B. Douglass, Middletown, Conn., and many other reliable firms are sending out very good pumps. These firms will all send catalogues free on application.

The best nozzle that we have used is the "McGowen," made by John J. McGowen, Ithaca, N. Y., and costs $1.00.

When to spray and why:—No definite time for beginning the work can be stated as this will depend on the season and on the object in view. It is of course understood that the arsenites—of which Paris green is preferred—are used to destroy insects which eat the leaves or fruit, such as bud-moth, canker-worm, codling-moth, etc. The copper salts, of which the best preparation is the Bordeaux mixture, are used to prevent the spread of fungous diseases such as apple scab, brown rot, etc. If the two classes of enemies are to be met, the remedies may be applied at one operation.

In general our recommendation for preventing apple scab would be to spray with Bordeaux mixture just before the fruit buds open, again with the same just as the blossoms fall, and repeat the operation once or twice at intervals of two or three weeks if the season is wet. In the first two lots applied, Paris green should be added in the proportion of 1 ℔ to 150 or 200 gallons, thus destroying leaf-eating insects and the codling-moth.

At least three sprayings should be given as above, and many would advise treatment with a solution of pure copper sulphate —1℔. to 15 gallons water—before the buds burst in spring. There is some question about the importance of this early treatment, but in our own experience such treatment has usually been found advantageous.

Preparation of Bordeaux mixture:—It would seem that this most important of the fungicides should now be perfectly familiar to every orchardist; but it is still a subject of frequent inquiry. As usually prepared the mixture consists of 6 ℔s. copper sulphate, 4 ℔s. quick lime and 50 gallons water. The copper salt is dissolved in a wooden tub, the lime slaked in a separate vessel and when ready for use the two are mixed and diluted as above.

In large orchards much time may be saved by preparing stock solutions of the lime and copper instead of constantly making up a new batch. Dissolve 40 lbs. of copper sulphate in as many gallons of water. A gallon of the solution will thus contain 1 lb. of the copper salt. In a similar way a stock solution of lime may be prepared. Keep both solutions tightly covered and stir thoroughly before dipping any out. A gallon of clear lime water contains only one-sixth of an ounce of lime instead of a pound, as desired. It is now a very simple matter to take six gallons of the copper solution, four of the lime and dilute to the requisite amount.*

Some other formulas:—The Bordeaux mixture and Paris green above mentioned are the standard remedies for orchard work. But there are some insects which are best reached by other means, and it is assumed that the orchardist knows what he is fighting before commencing operations. For currant worms, the specific—after the fruit has set—is fresh white hellebore. For the first brood of this insect we always use Paris green. Aphis and scale insects are best met with kerosene emulsion. For brown rot of plums, after the fruit has partly developed, the ammoniacal solution of copper carbonate is preferred to Bordeaux mixture, as the latter discolors the fruit.

KEROSENE EMULSION.

Hard soap	½ pound.
Boiled water	1 gallon.
Kerosene	2 gallons.

Dissolve the soap in the water, add the kerosene and churn through a force pump for five to ten minutes. In general, dilute about ten times before using. On very tender succulent plants dilute fifteen or twenty times, and for scale insects on woody plants dilute only five times.

HELLEBORE.

Fresh white hellebore	1 ounce.
Water	3 gallons.

A little flour paste added to the mixture will cause it to adhere to the foliage better.

*This subject was fully discussed before the Maine Pomological Society in January, 1895. See Rep. Maine Pom. Soc., 1894, p. 56.

AMMONIACAL COPPER CARBONATE.

Copper carbonate	1 ounce.
Ammonia water	1 quart.
Water	9 gallons.

For this purpose take the strongest ammonia, 26 degrees Beaumé, and dilute it with seven or eight volumes of water before using. This stock solution may be kept indefinitely in closely corked bottles. Dilute as above when ready for use. Several other formulas for the solution of copper carbonate are given, but this one will be found most convenient.

There are many other valuable insecticides and fungicides, but those above named are the most important. It is hoped that the warfare against disease and insect enemies of the orchard will be waged this year as never before.

MAINE STATE COLLEGE,
ORONO, ME., April 10, 1896.

BULLETIN No. 30.

INSPECTION OF FERTILIZERS, 1896.

The bulletin gave the manufacturer's guarantees, the analyses of manufacturer's samples and of samples collected by the Station, but as these figures are of only passing value they are omitted here.

BULLETIN No. 31.

A MODIFICATION OF THE BABCOCK METHOD AND APPARATUS FOR TESTING MILK AND CREAM.

J. M. BARTLETT.

The modifications described in this bulletin, briefly stated, are as follows:

The modification of the method consists chiefly in filling the bottles with hot water after the milk or cream and acid are added, before they are put in the centrifugal machine and whirled. In this way the separation is completed with one whirling and the time required for the second whirling is saved.

The modifications of the apparatus are: The base portions of the milk and cream bottles are graduated so that no acid measure is required and the base portion of the cream bottle is reduced in size.

While working with the Babcock test some months ago it occurred to the writer that separating the fat before adding water was an unnecssary part of the process if the right conditions could be brought about and that the hot water might be added directly after mixing the acid and milk together. Accordingly, to decide the matter, a series of experiments were conducted, resulting in the adoption of the following method, which has been used successfully for the past six months with all kinds of milk and cream.

METHOD FOR MILK.

After the milk is mixed by stirring or pouring from one vessel to another, the required amount, 17.6 cubic centimeters, is measured into the test bottle. It is then heated to about 70 degrees Fahrenheit, if not already at that temperature, by setting the bottles in a tank of warm water. Twenty cubic centimeters of sulphuric acid (specific gravity 1.82 to 1.825) are added and the bottle shaken by giving it a rotary motion until the milk and acid are thoroughly mixed. The mixture is then allowed to stand not less than five minutes. No harm is done if it stands longer than five minutes and in fact, occasionally, some kinds of milk have to be given a little more time. After standing the necessary time the bottle is given another gentle shake to mix in and dissolve any particles of curd that may have risen to the surface. Hot water is then added nearly to the uppermost mark, the bottle is put in the centrifugal machine and whirled for five minutes at the rate of 1,000 to 1,200 revolutions per minute. A steam turbine machine is best for this purpose but a hand or belt power machine can be used, if hot water is put in the pan to keep the fat melted. After the whirling is completed the percentage of fat can be read off in the usual manner.

It would appear that the time required for the bottles to stand after the acid is mixed with the milk, would offset that gained by omitting the second whirling which is made in the old method; but the writer has often found it necessary with many kinds of milk, especially with that from cows much advanced in the period of lactation, to allow the bottles to stand a while, even when working the two whirling method, in order to get a clear separation of fat. However, every one who does much testing should have at least two sets of bottles, so there would be no loss of time by this process. When two sets of bottles are at hand one set, charged with the milk and acid, can stand while the second set is being filled, and the second set can stand while the first is being whirled. It is much better to make twelve tests at a time than to make a larger number. Twelve are about all one can easily read off before the fat begins to cool and contract in volume.

For the above described modification of the milk test no change of apparatus need be made, but the writer, however, prefers to have the base portion of the bottle graduated as before mentioned so no acid measure is required and only one pouring of the acid is necessary. By having the bottle marked at the point A, Fig. 1, at which mark it holds 37.5 cubic centimeters, one can, after the milk is measured in with the pipette, run the acid in until it is filled to this point. It was found impracticable to use a bottle with a smaller base capacity like the cream bottle described farther on, because of the larger amount of curd in milk than in cream and the small size of the neck of the milk bottle necessitating more space for shaking, breaking up the curd and dissolving it in the acid.

THE CREAM BOTTLE.

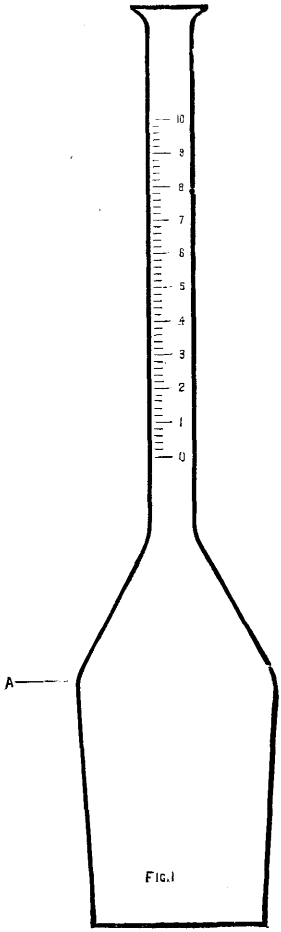


FIG. 1

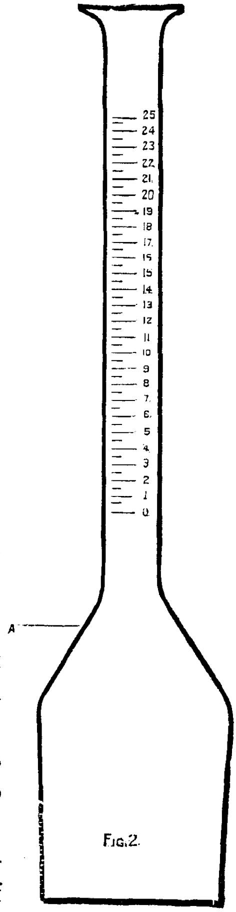


FIG. 2

The bottle here described (Fig. 2) is similar to the regular milk bottle, and also to the Connecticut Station cream bottle, except that the base portion is made of such size as to avoid using an acid measure. The base is made to hold about 38 cubic centimeters up to the neck and after the cream is measured in, the required amount of acid can be added by filling the bottle nearly to the neck or to the point A shown in the cut. The neck portion is large enough to carry 25 per cent. of fat and is graduated to one-half of one per cent. and can be easily read to one-quarter of one per cent. Each per cent. is numbered. Although one cannot read so closely with this as with the bulb neck bottle (described in Bulletin No. 3, Second Series, Maine Experiment Station), which was designed to test both milk and cream, one can read fine enough for all practical purposes. On account of the neck being larger and shorter, this bottle is more easily cleaned than either of the older forms; it is less liable to breakage, and by using the method previously given for milk a test can be made more rapidly. Twenty-five per cent. was fixed upon as the capacity of the neck for the reason that a much higher percentage necessitates an increase in diameter which impairs the accuracy in reading and again, nearly all cream shipped to the creameries is raised by the cold deep setting process and seldom contains more than twenty per cent. of fat. If one wishes to test separator cream that is very rich, 9 cubic centimeters or 9 grams of the cream can be taken instead of 18, 9 cubic centimeters of water added and the usual amount of acid. The per cent. of fat obtained in that case of course should be multiplied by two, to give a correct reading.

COMPARISON OF RESULTS OBTAINED BY OLD AND NEW METHODS.

Below are given, in tabular form, a few of the many results obtained on milk and cream in comparing the old method with the one whirling method.

MILK.		MILK.		MILK.		CREAM.	
Whirled once.	Whirled twice.	Whirled once.	Whirled twice.	Whirled once.	Whirled twice.	Whirled once.	Whirled twice.
% 5.3	% 5.3	% 5.2	% 5.3	% 3.8	% 3.7	% 18¾	% 18¾
5.6	5.6	5.3	5.4	4.1	4.2	18½	18¾
6.0	6.0	4.7	4.8	5.2	5.0	18¾	18¾
4.9	4.9	5.0	4.9	5.1	5.2	18½	18¾
4.9	5.0	5.8	5.8	5.3	5.1	23½	23¼
5.2	5.2	5.0	5.0	5.0	5.0	23¾	......
4.6	4.6	4.9	4.9	5.0	5.2	17	17¼
5.0	5.1	4.9	5.0	5.7	5.8	19¼	19

METHOD FOR CREAM.

The method employed for cream is as follows:

Measure 18 cubic centimeters or weigh 18 grams of the thoroughly mixed cream, carrying not more than 25 per cent. of fat, into the bottle. Heat it to about 70° F. if not already at that temperature, then fill the bottle up nearly to the base of the neck (point A, fig. 2) with sulphuric acid, specific gravity 1.82. The acid can be handled in a sharp-nosed pitcher or run in from a syphon affixed to a bottle or carboy. Mix the acid and cream together thoroughly, which is best done by grasping the neck with the hand, pressing the thumb tightly over the opening and then giving the bottle a rotary motion, holding it upright all the time. The confined air prevents the curd from coming up and sticking to the sides of the neck. The mixing is just as easily done in this as in the old style bottle. The remainder of the process is conducted exactly the same as for testing milk previously given.

If the above directions are followed, a perfectly clear separation will be obtained and also a considerable saving of time over the old method, as only one pouring of the acid and one whirling of the machine are made.

WEIGHING CREAM FOR THE TEST INSTEAD OF MEASURING.

Cream containing twenty-five per cent. of fat or less when sweet and not frothing can be measured with sufficient accuracy to give good results. But when such cream becomes sour it is impossible to get it in condition to measure without a good deal of trouble. If it is simply broken up by shaking, as is often done, it will contain so many air bubbles that the cream drawn into the pipette will weigh less than 18 grams. To illustrate what a difference there is the writer made several tests of sweet cream, then the same samples were allowed to stand in the jars until sour, broken up by simply shaking and tests made by both weighing and measuring out the samples.

	Sweet cream measured.	Sour cream measured.	Sour cream weighed.
No. 1	17¼%	14½%	17¼%
No. 2	18	16	18¼
No. 3	20½	18½	20½

Thick separator cream, which will always contain air bubbles if stirred enough to get a good sample, cannot be accurately measured and must be weighed to get a reliable result; and the writer has become thoroughly convinced that it is necessary for every creamery to have some means at hand to test such cream accurately. For this purpose the Station is having a special weighing scale made with which one can weigh nearly as rapidly as he can measure with a pipette. When completed it will be on sale by dealers in testing apparatus.

PRECAUTIONS.

That good results and clear separations can be obtained by the previously described modifications the writer and others connected with the College have fully demonstrated. It is necessary, however, that certain details be strictly observed to attain success and to make those points more prominent they are repeated as precautions.

1st. *The acid must be of the proper strength;*—1.82 specific gravity at 60 degrees Fahrenheit is more universally successful than a stronger acid, though 1.825 may be used in some cases. With very rich milk 20 to 21 c. c. of acid of 1.82 specific gravity works much better than a smaller quantity of strong acid, probably because there is less water in rich milk to properly dilute the acid than in poor milk. Rather thin milk will give good results with acid of quite varying strength. If the acid is too strong the fat will be blackened or black particles will appear in the lower part of the fat column. If the acid is not strong enough the fat will appear cloudy and white particles of curd will collect at the lower part of the column so that an accurate reading cannot be made.

2nd. *The milk or cream should not be colder than 70° Fahrenheit or warmer than 80° Fahrenheit when the acid is added.* If the milk or cream is too cold the curd will not all be dissolved in the time allowed, and the fat will appear cloudy with white particles in the lower part of the column which will interfere with the reading. If the milk or cream is too warm the action of the acid will be too violent, the fat will be burned and the whole column appear blackened or if only slightly burned black particles will appear in the lower part of the column.

3rd. *The acid and milk or cream must be thoroughly mixed together and the mixture stand not less than five minutes before hot water is added; otherwise a clear separation will not be obtained.* It is also best to shake the bottle again slightly, just before adding the hot water, to dissolve any particles of curd that have risen with the fat.

4th. *The bottles must be whirled and heat applied as directed or the separation is liable to be incomplete.* Sometimes a cloudy fat can be cleared by heat and longer whirling.

INSPECTION LAWS IN FORCE IN MAINE.

The text of the laws to regulate the sale and analysis of commercial fertilizers, the testing of glassware used at creameries, and to regulate the sale and analysis of commercial concentrated feeding stuffs are given in full. The law regulating the sale of agricultural seeds is not an inspection law but as it is an important law and some of its provisions are entrusted to the Station Director, it is also printed herewith in full.

An Act to regulate the sale and analysis of Commercial Fertilizers.

Section 1. Every manufacturer, company or person who shall sell, offer or expose for sale in this state any commercial fertilizer or any material used for fertilizing purposes, the price of which exceeds ten dollars per ton, shall affix to every package of such fertilizer in a conspicuous place on the outside thereof, a plainly printed statement clearly and truly certifying the number of net pounds in the package sold or offered for sale, the name or trade mark under which the article is sold, the name of the manufacturer or shipper, the place of manufacture, the place of business and a chemical analysis stating the percentage of nitrogen, or its equivalent in ammonia in available form, of potash soluble in water, and of phosphoric acid in available form, soluble and reverted as well as the total phosphoric acid.

Sect. 2. Every manufacturer, company or person who shall sell, offer or expose for sale in this state any commercial fertilizer or material used for fertilizing purposes, the price of which exceeds ten dollars per ton, shall for each and every fertilizer bearing a distinguishing name or trade mark, file annually with the Director of the Maine Agricultural Experiment Station, between the fifteenth day of November and the fifteenth day of December, a certified copy of the statement, named in section one of this act, said certified copy to be accompanied, when required, by a sealed glass jar or bottle containing at least one pound of the fertilizer to be sold or offered for sale, and the company or person filing said certified copy with its accompanying sample of fertilizer shall thereupon make affidavit that said sample corresponds within reasonable limits to the fertilizer which it represents in the percentage of nitrogen, total and available phosphoric acid, and potash soluble in water which it contains. Such affidavit shall apply to the entire calendar year next succeeding the date upon which said affidavit is made, unless the person or persons making such affidavit shall give notice to the Director of the Maine Experiment Station that a change is to be made during the year in the percentages of the above named ingredients contained in the fertilizer, in which case he shall, before selling or offering for sale such fertilizer, file another certified statement with an accompanying sample of fertilizer and an affidavit as hereinbefore required. The deposit of a sample of fertilizer as herein provided shall be required by said Director unless the company, manufacturer or person selling or offering for sale a fertilizer coming within the provisions of this act, shall certify that its composition for the succeeding year is to be the same as given in the last previously certified statement, in which case the requiring of said sample shall be at the discretion of said Director.

Sect. 3. The Director of the Maine Experiment Station shall analyze, or cause to be analyzed, all the samples of fertilizers which come into his possession under the provisions of section two of this act, and shall publish the results thereof in a bulletin or report on or before the fifteenth of March next succeeding.

Sect. 4. Any manufacturer, importer, agent or seller of any commercial fertilier, who shall deposit with the Director of the Maine Experiment Station a sample or samples of fertilizer under the provisions of section two of this act, shall pay annually to said Director an analysis fee as follows: Ten dollars for the phosphoric acid and five dollars each for the nitrogen and potash, contained or said to be contained in the fertilizer, this fee to be assessed on any brand sold in the State, and upon receipt of such fee and of the certified statement named in section two of this act, said Director shall issue a certificate of compliance with this act. Whenever the manufacturer or importer of a fertilizer shall have filed the statement made in section two of this act and paid the analysis fee, no agent or seller of said manufacturer, importer or shipper shall be required to file such statement or pay such fee. The analysis fees received by said Director shall be paid immediately by him into the treasury of said Experiment Station.

Sect. 5. Any manufacturer, importer or person who shall sell, offer or expose for sale in this State any commercial fertilizer without complying with the requirements of sections one, two and four of this act, or any fertilizer which contains substantially a smaller percentage of constituents than are certified to be contained, shall, on conviction in a court of competent jurisdiction, be fined one hundred dollars for the first offense, and two hundred dollars for each subsequent offense.

Sect. 6. The Director of the Maine Experiment Station shall annually analyze, or cause to be analyzed, at least one sample, to be taken in the manner hereinafter prescribed, of every fertilizer sold or offered for sale under the provisions of this act. Said Director is hereby authorized and directed in person or by deputy to take a sample not exceeding two pounds in weight, for said analysis, from any lot or package of fertilizer or any material used for manurial purposes which may be in the possession of any manufacturer, importer, agent or dealer in this State; but said sample shall be drawn in the presence of said party or parties in interest, or their representative, and taken from a parcel or a number of packages which shall not be less than ten per cent. of the whole lot sampled, and shall be thoroughly mixed and then divided into two equal samples and placed in glass vessels and carefully sealed and a label placed on each, stating the name or brand of the fertilizer or material sampled, the name of the party from whose stock the sample was drawn and the time and place of drawing, and said label shall also be signed by the Director or his deputy and by the party or parties in interest or their representatives at the drawing and sealing of said samples; one of said duplicate samples shall be retained by the Director and the other by the party whose stock was sampled; and the sample or samples retained by the Director shall be for comparison with the certified statement named in section two of this act. The result of the analysis of the sample or samples so procured shall be published in a report or bulletin within reasonable time.

Sect. 7. Whenever the Director becomes cognizant of the violation of any of the provisions of this act he shall report such violation to the Secretary of the Board of Agriculture, and said Secretary shall prosecute the party or parties thus reported; but it shall be the duty of said Secretary upon thus ascertaining any violation of this act, to forthwith notify the manufacturer or importer in writing, and give him not less than thirty days thereafter in which to comply with the requirements of this act, but there shall be no prosecution in relation to the quality of any fertilizer or fertilizing material if the same shall be found substantially equivalent to the certified statement named in section two of this act.

Sect. 8. All acts and parts of acts inconsistent with this act are hereby repealed.

Sect. 9. This act shall take effect when approved.

Approved February 24, 1897.

Chapter 169.

An Act for the Protection of Dairymen.

Section 1. All bottles, pipettes or other measuring glasses used by any person, firm or corporation, or their agents or employes, at any creamery, butter factory, cheese factory or condensed milk factory, or elsewhere in this State, in determining by the Babcock test, or by any other test, the value of milk or cream received from different persons or parties at such creameries or factories, shall before such use be tested for accuracy of measurement and for accuracy of the per cent. scale marked thereon. Such bottles, pipettes or measuring glasses shall bear in marks or characters ineffaceable the evidence that such test has been made by the authority named in section two of this act. And no inaccurate bottles, pipettes or other glasses shall bear such marks or characters.

Sect. 2. It is hereby made the duty of the Director of the State College Experiment Station, or other competent person designated by him, to test the accuracy of all bottles, pipettes or other measuring glasses used by persons, firms or corporations in this State buying or pooling milk or cream, or apportioning butter or cheese made from the same, by the contents of butter fat contained therein. The Director of the Experiment Station or the person designated by him, shall mark such bottles, pipettes or other measuring glasses as are found correct, in marks or characters which cannot be erased, and which marks or characters shall stand as proof that they have been so tested. The Director of the Experiment Station shall receive for such service the actual cost incurred, and no more, the same to be paid by the persons or corporations for whom it is done.

Sect. 3. Any person, either for himself or in the employ of any other person, firm or corporation, who manipulates the Babcock test or any other test, whether mechanical or chemical, for the purpose of measuring the contents of butter fat in milk or cream for a basis of apportioning the value of such milk or cream, or the butter or cheese made from the same, shall secure a certificate from the superintendent of the dairy school at the State College of Agriculture and Mechanic Arts that he or she is competent and well qualified to perform such work. The rules and regulations in the application for such certificate and in the granting of the same shall be such as the superintendent of that school may arrange, and the fee for issuing a certificate shall in no case exceed one dollar, the same to be paid by the applicant.

Sect. 4. Whoever uses, or has in his possession with intent to use, at any creamery, butter factory, cheese factory or condensed milk factory, any sulphuric acid of less than one and eighty-two hundredths of specific gravity in the process known as the Babcock test, or any other test for determining the butter fat contents of milk or cream, shall on conviction pay a fine not exceeding twenty-five dollars for the first offense, and for a second offense a sum not exceeding fifty dollars. Any person, firm or corporation violating the provisions of section one of this act, shall on conviction pay a fine not exceeding fifty dollars for the first offense, and for a second offense a sum not exceeding one hundred dollars; and any person violating section three of this act shall on conviction pay a fine not exceeding ten dollars. And it shall be the duty of every inspector of milk, sheriff, deputy sheriff and constable to institute complaint against any person or persons violating the within named provisions of this act, and on conviction one-half of the fines shall go to complainant and the balance to the State.

Sect. 5. This act shall take effect in six months from the date of its approval.

Approved March 27, 1895.

Chapter 334.

An Act to regulate the sale and analysis of Concentrated Commercial Feeding Stuff.

Section 1. Every manufacturer, company or person who shall sell, offer or expose for sale or for distribution in this State any concentrated commercial feeding stuff, as defined in section three of this act, used for feeding farm live stock, shall, in addition to the tax tag described in section five of this act, affix to every package of such feeding stuff, in a conspicuous place on the outside thereof, a plainly printed statement clearly and truly certifying the number of net pounds in the package sold or offered for sale, the name or trade mark under which the article is sold, the name of the manufacturer or shipper, the place of manufacture, the place of business and a chemical analysis stating the percentage of crude protein, allowing one per cent. of nitrogen to equal six and one-fourth per cent. of protein, and of crude fat it contains, both constituents to be determined by the methods adopted at the time by the Association of Official Agricultural Chemists.

Sect. 2. The term concentrated commercial feeding stuff, as here used, shall not include hays and straws, the whole seeds nor the unmixed meals made directly from the entire grains of wheat, rye, barley, oats, Indian corn, buckwheat, and broom corn. Neither shall it include wheat, rye and buckwheat brans or middlings, not mixed with other substances, but sold separately, as distinct articles of commerce, nor pure grains ground together.

Sect. 3. The term concentrated commercial feeding stuff, as here used, shall include linseed meals, cotton-seed meals, pea meals, cocoanut meals, gluten meals, gluten feeds, maize feeds, starch feeds, sugar feeds, dried brewer's grains, malt sprouts, hominy feeds, cerealine feeds, rice meals, oat feeds, corn and oat chops, ground beef or fish scraps, mixed feeds, and all other materials of similar nature not included within section two of this act.

Sect. 4. Before any manufacturer, company or person shall sell, offer or expose for sale in this State any concentrated commercial feeding stuff, as defined in section three of this act, he or they shall for each and every feeding stuff bearing a distinguishing name or trade mark, file with the Director of the Maine Agricultural Experiment Station a certified copy of the statement named in section one of this act, said certified copy to be accompanied, when the Director shall so request, by a sealed glass jar or bottle containing at least one pound of the feeding stuff to be sold or offered for sale, and the company or person furnishing said sample shall thereupon make affidavit that said sample corresponds within reasonable limits to the feeding stuff which it represents, in the pércentage of protein and fat which it contains.

Sect. 5. Each manufacturer, importer, agent or seller of any concentrated commercial feeding stuff, as defined in section three of this act, shall pay to the Director of the Maine Agricultural Experiment Station an inspection tax of ten cents per ton for each ton of such concentrated feeding stuff sold or offered for sale in the State of Maine, and shall affix to each car shipped in bulk and to each bag, barrel or other package of such concentrated feeding stuff, a tag to be furnished by said Director, stating that all charges specified in this section have been paid. The Director of said Experiment Station is hereby empowered to prescribe the form for such tags, and adopt such regulations as may be necessary for the enforcement of the law. Whenever the manufacturer or importer or shipper of a concentrated feeding stuff shall have filed the statement made in section one of this act and paid the inspection tax, no agent or seller of said manufacturer, importer or shipper shall be required to file such statement or pay such tax. The amount of inspection tax received by said Director shall be paid by him into the treasury of the Maine Agricultural Experiment Station. The treasurer of said Station shall make an annual report of receipts and expenditures of funds from this inspection tax, and all receipts in excess of three thousand dollars shall be carried into the state treasury.

Sect. 6. Any manufacturer, importer or person who shall sell, offer or expose for sale or for distribution in this state any concentrated commercial feeding stuff, as defined in section three of this act, without complying with the requirements of the preceding sections of this act, or any feeding stuff which contains substantially a smaller percentage of constituents than are certified to be contained, shall, on conviction in a court of competent jurisdiction, be fined not more than one hundred dollars for the first offense, and not more than two hundred dollars for each subsequent offense.

Sect. 7. The Director of the Maine Experiment Station shall annually analyze, or cause to be analyzed, at least one sample to be taken in the manner hereinafter prescribed, of every concentrated commercial feeding stuff sold or offered for sale under the provisions of this act. Said Director is hereby authorized and directed in person or by deputy to take a sample, not exceeding two pounds in weight, for said analysis, from any lot or package of concentrated commercial feeding stuff which may be in the possession of any manufacturer, importer, agent or dealer in this state; but said sample shall be drawn in the presence of said party or parties in interest, or their representative, and taken from a parcel or a number of packages, which shall not be less than ten per cent. of the whole lot sampled, and shall be thoroughly mixed, and then divided into two equal samples, and placed in glass vessels, and carefully sealed and a label placed on each, stating the name or brand of the feeding stuff or material sampled, the name of the party from whose stock the sample was drawn and the time and place of drawing, and said label shall also be signed by the Director or his deputy and by the party or parties in interest or their representative at the drawing and sealing of said samples; one of said duplicate samples shall be retained by the Director and the other by the party whose stock was sampled; and the sample or samples retained by the Director shall be for comparison with the certified statement named in section four of this act. The result of the analysis of the sample or samples so procured, together with such additional information as circumstances advise, shall be published in reports or bulletins from time to time.

Sect. 8. Whenever the Director becomes cognizant of the violation of any of the provisions of this act, he shall report such violation to the Secretary of the Board of Agriculture, and said Secretary shall prosecute the party or parties thus reported; but it shall be the duty of said Secretary, upon thus ascertaining any violation of this act, to forthwith notify the manufacturer, importer or dealer in writing, and give him not less than thirty days thereafter in which to comply with the requirements of this act, but there shall be no prosecution in relation to the quality of any concentrated commercial feeding stuff if the same shall be found substantially equivalent to the certified statement named in section four of this act.

Sect. 9. All acts and parts of acts inconsistent with this act are hereby repealed.

Sect. 10. This act shall take effect October first, eighteen hundred and ninety-seven.

Approved March 27, 1897.

Chapter 313.

An Act to regulate the sale of Agricultural Seeds.

Section 1. Every lot of seeds of agricultural plants, whether in bulk or in package, containing one pound or more, and including the seeds of cereals, (except sweet corn), grasses, forage plants, vegetables, and garden plants but not including those of trees, shrubs and ornamental plants, which is sold, offered or exposed for sale for seed by any person or persons in Maine, shall be accompanied by a written or printed guarantee of its percentage of purity, freedom from foreign matter; provided, that mixtures may be sold as such when the percentages of the various constitutents are stated.

Sect. 2. Dealers may base their guarantees upon tests conducted by themselves, their agents, or by the Director of the Maine Agricultural Experiment Station; provided, that such tests shall be made under such conditions as the said Director may prescribe.

Sect. 3. The results of all tests of seeds made by said Director shall be published by him in the bulletins or reports of the Experiment Station, together with the names of the person or persons from whom the samples of seeds were obtained. The said Director shall also publish equitable standards of purity together with such other information concerning agricultural seeds as may be of public benefit.

Sect. 4. Any person or persons who shall sell, offer or expose for sale or for distribution in this State agricultural seeds without complying with the requirements of sections one and two of this act, shall, on conviction in a court of competent jurisdiction, be fined not to exceed one hundred dollars for the first offense, and not to exceed two hundred dollars for each subsequent offense.

Sect. 5. Any person or persons who shall, with intention to deceive, wrongly mark or label any package or bag containing garden or vegetable seeds or any other agricultural seeds, not including those of trees, shrubs, and ornamental plants, shall be guilty of a misdemeanor and upon conviction in a court of competent jurisdiction shall be fined not to exceed one hundred dollars for the first offense and not to exceed two hundred dollars for each subsequent offense.

Sect. 6. The provisions of this act shall not apply to any person or persons growing or selling cereals and other seeds for food.

Sect. 7. Whenever the Director of the Maine Agricultural Experiment Station becomes cognizant of the violation of any of the provisions of this act, he shall report such violation to the Secretary of the Board of Agriculture, and said Secretary shall prosecute the party or parties thus reported.

Sect. 8. All acts and parts of acts inconsistent with this act are hereby repealed.

Sect. 9. This act shall take effect September one, eighteen hundred ninety-seven.

Approved March 26, 1897.

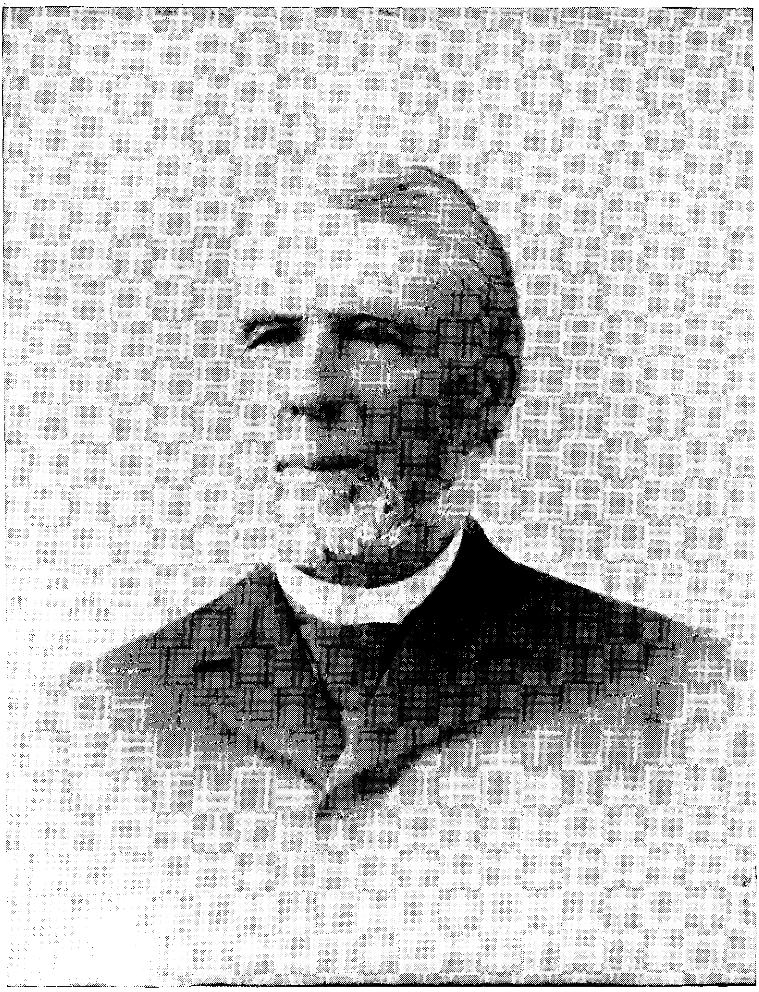
APPENDIX.

Annual Report of the State Pomological Society.

1896-97.

An apple orchard is sure to bear you several crops beside the apple. There is the crop of sweet and tender reminiscences dating from childhood and spanning the seasons from May to October, and making the orchard a sort of outlying part of the household. You have played there as a child, mused there as a youth or lover, strolled there as a thoughtful, sad-eyed man. Your father, perhaps, planted the trees or reared them from the seed, and you yourself have pruned and grafted them, and worked among them, till every separate tree has a peculiar history and meaning in your mind. Then there is the never-failing crop of birds—robins, goldfinches, king-birds, cedar-birds, hair-birds, orioles, starlings—all nesting and breeding in its branches, and fitly described by Wilson Flagg, as "Birds of the Garden and Orchard." Whether the pippin and sweetbough bear or not, the "punctual birds" can always be depended upon. Indeed, there are few better places to study ornithology than in the orchard. Besides its regular occupants, many of the birds of the deeper forest find occasion to visit it during the season. The cuckoo comes for the tent-caterpillar, the jay for frozen apples, the ruffed grouse for buds, the crow foraging for birds' eggs, the woodpecker and chickadees for their food, and the high-hole for ants. The red-bird comes, too, if only to see what a friendly covert its branches form, and the wood-thrush now and then comes out of the grove near by, and nests alongside of its cousin, the robin. The smaller hawks know that this is a most likely spot for their prey, and in the spring the shy northern warblers may be studied as they pause to feed on the fine insects amid its branches. The mice love to dwell here also, and hither come from the near woods the squirrel and the rabbit. The latter will put his head through the boy's slipper-noose any time for a taste of the sweet apple, and the red squirrel and chipmunk esteem its seeds a great rarity.

JOHN BURROUGHS.



HON. HENRY INGALLS, WISCASSET,
Second President of Maine State Pomological Society.

REPORT OF THE SECRETARY.

The industry represented by our society has gradually developed during past years, but its magnitude has been more conspicuous the past year in consequence of the large crop, and the difficulty of finding a market for it. While in years past it has been largely the office of our society to teach methods of culture, the present conditions are now leading the society to a fuller consideration of the markets and the selling of the fruits. At our winter meetings the topics involving the marketing of the fruit were those in which the liveliest interest was apparent. During the year the Secretary has had numerous subjects connected with fruit growing under consideration—some of these are elaborated in the papers and at our meetings by various speakers; some have appeared at our exhibitions and others must remain for future work. The following pages will afford the members of the society and others who may read them some idea of the general scope of the work. Compared with a dozen years ago, it will be seen the society is doing, as it certainly ought to do, a larger work.

OUR FRUIT CROP.

The fruit crop in 1896 was very large in the United States, nearly every fruit growing section having its full proportion. This made our crop in Maine appear, if anything, larger than it really was. With the exception of some of the small fruits there was a surplus of everything in the fruit line. Figures compiled by the American Agriculturist state that in Maine the apple crop for 1896 amounted to 2,080,000 barrels, and in 1895 to 790,000 barrels. The crop for New England is placed at 8,530,000 barrels in 1896 and 3,968,000 in 1895. While in the United States the figures amount to 58,960,000 barrels in 1896 and 60,543,000 in 1895. If these figures are correct the apple crop of 1895 in the entire country was larger than that of 1896.

Correspondents of the New England Homestead, estimated the town of Paris as having 10,000 barrels of apples; Kennebec county 500,000 barrels; Bridgton 10,000 barrels, and York county 125,000 barrels.

A detailed canvass of the town of Winthrop made by Mr. S. B. Friend found 26,159 barrels of marketable fruit. M. O. Edwards of Monmouth reports about 27,000 in that town, and Mr. F. S. Ricker reports 15,225 barrels in the town of Turner.

The detailed figures give some idea of the distribution of the product among the growers in Winthrop as follows:

Less than 100 barrels	186	growers
Between 100 and 200 barrels	45	"
Between 200 and 500 barrels	39	"
Between 500 and 800 barrels	6	"

The four largest growers had about 800 barrels each. In all there were 276 growers, showing that apples are generally grown in town by the farmers.

In Turner there were:

Less than 100 barrels	56	growers
Between 100 and 200 barrels	31	"
Between 200 and 500 barrels	13	"
Between 500 and 800 barrels	8	"
1000 barrels	1	"

109 growers in the town who had marketable fruit.

There are larger growers in other parts of the State, the largest having about 3,000 barrels, while there are several who have 2,000, possibly a dozen others 1,000 to 1,500 barrels each. These towns are probably as good fruit growing towns as any in the State and the extent of the crop here indicates the magnitude of the industry in the State.

A larger part of the trees are young, and many have not yet come into bearing. So that we may reasonably expect still larger crops in years to come.

Of the quality it may be said the State never produced better fruit. Either insects were less in numbers, or the size of the crop made their work less conspicuous. Certainly fungous diseases were less prevalent than in recent years.

THE SOCIETY AND THE STATE BOARD OF AGRICULTURE.

For various reasons which we are assured are from no ill feeling towards our society or its work, the State Board of Agriculture at its Annual meeting in January, 1896, after a prolonged discussion of the subject voted to discontinue the aid they have hitherto granted our society towards the expenses of our winter meeting.

As the present officers had no voice in originating the joint meetings and were not consulted regarding its discontinuance there seems to be no occasion for any comment beyond a statement of the facts.

Pooling funds for this meeting has secured the employment of distinguished speakers from a distance, at a time when under other circumstances it would have been impossible. So far as the Secretary is informed there has been only the most cordial feeling between the two organizations. Both are working along similar lines and now that the union has been severed, each ought to be the stronger for the independence. The Secretary has great confidence in the fruit-growers of the State, whose intelligence and enterprise will not permit a cause they have so long nourished to languish for want of means. The liberal aid now granted to us from the State will enable us to go on in our work, and depending upon our own resources will add to our strength.

OUR EXHIBITIONS.

By invitation of Hon. F. O. Beal, President of the Eastern Maine State Fair, negotiations were entered into for holding an exhibition with them. The executive officers, thinking the holding of such an exhibition would enable the society to exert a wider influence in the eastern part of the State, and all objections being overcome, the terms were agreed upon, being the same as between our society and the Maine State Agricultural Society, and $100 additional to meet the expenses of the officers of the society. The exhibition there was held August 25-28, 1896. We met many fruit and flower growers whom we found enthusiastic, and fond of their pursuits. At this exhibition there were fifty-eight exhibitors. We were treated with the utmost courtesy by President Beal and his associates, whose action was prompt and efficient in every way we desired. The wish was expressed and emphasized that the pleasant relations entered into at this exhibition might be continued in the future. We are also indebted to members of the press who gave our work in Bangor special prominence in the report of the fair.

The Lewiston exhibition, held a week later, was the largest in the record of the society. There were 102 different exhibitors who made some 1,500 entries, and many of the entries contained collections of fruits, flowers or canned goods. The tables and stands were crowded. The exhibition being so early in the season, the specimens of fruit were small and hardly more than half grown, but the plants and flowers were superior to any exhibition held by the society.

The chief object of the exhibition is educational—to show by perfect specimens what is being grown, and the better the specimen the better the lesson is taught. In other words, everything on exhibition should bear the mark of excellence that others may learn what may be grown in the State. Inferior fruit or plants in such a place do irreparable injury to the cause. If perchance such exhibits, as they sometimes do, carry away a premium, there is nothing a man need take any pride in, for while he may help himself to a dollar, he permits his action to weaken the character of the exhibition.

The officers have aimed at making the exhibition better in quality each year, but sometimes the quality of the exhibits is a discouraging feature. No one in competition for our premiums on special plates of apples and pears should think of showing anything but the best; if they do not have these they should leave them at home. In the collective exhibits, I am sorry to say, some of our largest exhibitors seem to forget that the same rule should bear with equal force. It is not to the credit of any one even here to show poor fruit, and for one, I hope we may have seen the last of it.

There were some plants at each of our exhibitions that loving hands had watered and cared for, which our judges criticised, because they were "leggy," leafless or ill-shaped, in other words they were inferior specimens.

At the Bangor exhibition one or two collections came in, several species of plants growing in the same boxes. They were entered first as collections, and some of them as specimen plants. It was difficult to find them, and in several cases impossible to determine which was which. It was an unpleasant duty to judge, and unsatisfactory as well. At Lewiston we have required that the exhibits shall be distinct, and the rule has been approved by all.

As there are many who have never exhibited at our fairs, the following suggestions are offered as likely to be of help in making up an exhibit of fruit or plants. In recent years at no small expense the society has employed experts, who know what exhibits should be, and who are conversant as well with varieties. This makes it all the more important to observe the suggestions offered.

DIRECTIONS FOR PREPARING EXHIBITIONS.

Fruit—The specimens should be perfect, i. e., free from bruises, scab and worms, and so far as possible tpyical of the kind. The specimens should be of uniform size and well colored. Monstrosities are not desired, nor freaks of any kind to make up collections. Small specimens of uniform size are far better than large and small together. Large specimens are better than small ones, but have them uniform. The stem should be left, and care should be taken not injure the calyx, which is often important in determining the identity of the fruit.

Do not polish the fruit nor remove the bloom. Wrap the specimens in soft paper and pack so they will not be bruised.

Don't exhibit fruit without name, except to have it named. The collective exhibit calls for correctly named varieties. If you have fruit, the name of which you have lost, our judges and officers will try to identify it.

Plants—They should be well grown specimens,and in healthy condition. A large plant may not be a well grown one. By a well grown plant is meant a thrifty, vigorous, well shaped plant. Have only one species in a pot, and as a rule only one plant. Don't forget to have the pots clean and in exhibition order. Where name is called for, be careful to have every specimen correctly named.

Cut flowers—It is better to cut flowers early in the morning. Pack them loosely and keep them both moist and cool. In collections the arrangement calls for taste, and the more attractive they are made the better the chance for a premium.

OUR PUBLIC MEETINGS.

At the Bangor fair an informal meeting was held in the council chamber. There were other exercises in City Hall and the attendance was small, but a cordial welcome was extended to the society by Mayor Beal, who expressed the wish that the pleasant relations that had been formed during the fair might be continued and that the society would always be welcome to any courtesies within the gift of the city. The other exercises were brief, but bore on the interests of the society and fruit growers.

During the Lewiston fair the annual meeting of the society was held in the hall provided for the purpose. As the election of officers required so much attention little time remained for the presentation of formal lectures or addresses. In years past the attendance has been good, but this year a drenching rain poured down, and people who had shelter were wise to enjoy it. As it was, the enthusiasm of the members brought out a good delegation. After listening to informal reports from the officers and electing officers for 1897, Messrs. Gilbert, Pope and others spoke, congratulating the members upon the prosperity of the society and the wide influence it was exerting in the State.

OUR WINTER MEETING.

Invitations for our winter meeting came in from Freeport, Rumford Falls, Winthrop, Skowhegan and Augusta. In each instance assurances came with the invitation of local co-operation. It was hard for the committee to determine which locality offered the greatest inducements. In accepting the invitation extended by Winthrop Grange to hold the meeting in Winthrop the committee felt it would be especially agreeable to the older members to return to the place where the society had its birth. The reception given by the members of the grange and the citizens was very cordial. Messrs. J. Henry Moore, R. Alden and F. C. Robie, serving as a committee for Winthrop

Grange, were active in their efforts and spared neither labor nor expense to provide for all the details as they appeared.

Of the programme arranged for the meeting, the Secretary may be permitted to say that it proved a very popular one and with the presentation of each paper new interest was awakened. It was particularly noticeable, that notwithstanding the prevailing low prices of fruit, there was no evidence of discouragement, for all seemed enthusiastic for the future. A full report of the papers and discussions may be found in the following pages of the transactions.

The exhibition of fruit was very large, nearly every county in the State being represented. The tables were crowded with fruit, which was of exceptionally good quality. There was an interesting collection of apples from the Experiment Station and another exhibition that had many admirers was shown by Mr. J. H. Reid of Frederickton, N. B. The specimens were large and free from imperfections. The collection of cranberries consisted of nine entries, which were well preserved. A jar of Mountain cranberries was shown by the Secretary, which grew either in New Brunswick or Nova Scotia. The perfection of this fruit afforded the best of evidence that Maine can raise good cranberries and the interest was an evidence that soon we shall have no need of sending to the Cape for this delicious fruit. The exhibition of apple jellies was large and attractive. The collection shown by Mrs. Benson Grant consisted of twenty-five or more tumblers, made of as many different varieties of apple. There were several tumblers in which the apple was used as the base and then flavored with pine apple, lemon, raspberry or some other fruit. The rare qualities of the jellies shown in this exhibit are suggestive of a possible outlet for much fruit that now yields the growers little profit.

D. H. KNOWLTON, Secretary.

Farmington.

OFFICERS FOR 1897.

President.

JOHN W. TRUE, New Gloucester.

Vice Presidents.

S. H. DAWES, Harrison.

D. P. TRUE, Leeds Center.

Secretary.

D. H. KNOWLTON, Farmington.

Treasurer.

CHARLES S. POPE, Manchester.

Executive Committee.

The President and Secretary, *ex-officio;* A. E. Andrews, Gardiner: Z. A. Gilbert, North Greene; C. H. George, Hebron.

Trustees.

Androscoggin	County,	Chas. E. Waterman, East Auburn.
Aroostook	"	Edward Tarr, Castle Hill.
Cumberland	"	T. M. Merrill, West Gloucester.
Franklin	"	Herman Corbett, Farmington.
Hancock	"	Mrs. S. L. Brimmer, Mariaville.
Kennebec	"	E. A. Lapham, Pittston.
Knox	"	Alonzo Butler, Union.
Lincoln	"	H. J. A. Simmons, Waldoboro'.
Oxford	"	S. M. King, South Paris.
Penobscot	"	W. M. Munson, Orono.
Piscataquis	"	H. L. Leland, East Sangerville.
Sagadahoc	"	A. P. Ring, Richmond Corner.
Somerset,	"	F. E. Nowell, Fairfield.
Waldo	"	Fred Atwood, Winterport.
Washington	"	J. F. Sprague, Charlotte.
York	"	Edward H. Emery, Sanford.

Member of Experiment Station Council.

Chas. S. Pope, Manchester.

Committee on New Fruits.

S. M. King, South Paris; Willis A. Luce, South Union; John W. Dudley, Castle Hill.

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, H. N ....Hallowell
Atherton, Wm. P...... ....Hallowell
Atkins, Charles G ....Bucksport
Atwood, Fred. ....Winterport
Averill, David C.......... ....Temple
Bailey, W. G.. ....Freeport
Bennoch, John E ....Orono
Bisbee, George E..................Auburn
Boardman, Samuel L......... ..Augusta
Briggs, D. J..... .... .South Turner
Briggs, John................ .....Turner
Burr, John...... ....Freeport
Butler, Alonzo.......... ....Union
*Carter, Otis L ....Etna
Chandler, Mrs. Lucy A ....Freeport
Chase, Henry M.,103 Federal St.,Portland
Chase, Martin V. B ....Augusta
*Clark, Eliphalet........ ....Portland
Cole, Horatio G ....Boston, Mass
Corbett, Herman ....Farmington
Crafts, Moses ....Auburn
*Crosby, William C ....Bangor
Crowell, John H ....Temple
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, Albert........ ....Bangor
Emerson, Charles L. ... .South Turner
Farnsworth, B. B.... ....Portland
Frost, Oscar F ....Monmouth
*Gardiner, Robert H............Gardiner
Gardiner, Robert H........Boston, Mass
George, C. H . ...Hebron
Gilbert, Z. A.... ....North Greene
Goddard, Lewis C ... .Woodfords
*Godfrey, John E ....Bangor
Grover, Franklin D ....Bean
Gurney, Lemuel ....Hebron
Hackett, E. C... .... .. West Gloucester
Hall, Mrs. H. A.............. ....Brewer
Hanscom, John .... Saco
*Harlow, S. C..................... Bangor
*Harris, N. C ....Auburn
Harris, N. W ....Auburn
Harris, William M.................Auburn
Harvey, F. L...... . ...Orono
*Hersey, T. C ....Portland
Hobbs, M. Curtis... ..West Farmington
*Hoffses, Elmas....... ....Warren
Hoxie, James S...........North Fairfield
Hoyt, Mrs. Francis........... .Winthrop
*Ingalls, Henry .... Wiscasset
Jackson, F. A.....................Winthrop
*Jewett, George...... ....Portland
Johnson, Isaac A..................Auburn
*Jordan, Francis C.......... ....Brunswick
*Kenniston, E. H..................Arnold
Keene, Charles S ....Turner
Knowlton, D. H..............Farmington
Lapham, E. A ....Pittston
*Larrabee, O. L........ ....West Levant
Litchfield, J. H ....Auburn
Lombard, Thurston M ....Auburn
*Low, Elijah...................... Bangor
*Low, S. S.. ....Bangor
Luce, Willis A...... .... South Union
McLaughlin, Henry ....Bangor
Merrill, T. M..... ......West Gloucester
*Metcalf, M. J.......... .. ..Monmouth
Moody, Charles H .... Turner
Moore, William G.............Monmouth
Moor, F. A............... ......Waterville
Morton, J. A.................... ....Bethel

*Deceased.

LIFE MEMBERS—CONCLUDED.

*Morton, William E.............Portland
*Noyes, Albert.................Bangor
Perley, Chas. I................Cross Hill
Pope, Charles S.............Manchester
Prince, Edward M....West Farmington
Pulsifer, D. W....................Poland
Purington, E. F.....West Farmington
*Richards, F. G.................Gardiner
Richards, John T.............Gardiner
*Richardson, J. M...............Gardiner
Ricker, A. S......................Turner
Ridley, B. H.........................Jay
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
*Shaw, Stillman W.........West Auburn
Simmons, H. J. A.............Waldoboro
Skillings, C. W.............North Auburn
*Smith, Alfred.....................Monmouth
Smith, Henry S..............Monmouth
Starrett, L. F.....................Warren
Stetson, Henry...................Auburn
*Stetson, Isaiah....................Bangor
Stilphen, Asbury C............Gardiner
Stanley, Charles................Winthrop
Stanley, O. E....................Winthrop
*Staples, G. K........................Temple
Strout, S. F.............West Falmouth
*Strattard, Mrs. A. B.............Monroe
*Sweetser, S. R.....Cumberland Center
*Taylor, Joseph.....................Belgrade
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
*Varney, James A..The Dalles, Oregon.
Vickery, James.................Portland
Vickery, John.........................Auburn
Wade, Patrick....................Portland
Walker, Charles S......................Peru
Waterman, Willard H......East Auburn
*Weston, James C....................Bangor
Wharff, Charles S...............Gardiner
Wheeler, Charles E.........Chesterville
Whitney, Edward K............Harrison
*Woodard, Mrs. S. M............Gardiner
Woodman, George W.............Portland

ANNUAL MEMBERS, 1896.

Allen, Miss Hattie................Bangor
Andrews, Gideon....................Herman
Archer, Mrs. Geo. F..............Clifton
Bailey, Abbie F.................Freeport
Bailey, Mrs. W. H...................Bangor
Barrett, Mrs. C. C..................Brewer
Bartlett, Carle S....................Bangor
Bartlett, T. W.............East Dixmont
Beers, Carl...............................Bangor
Bickford, A. K.....................Monmouth
Bickford, James.......................Carmel
Brimmer, Mrs. S. L...................Tilden
Clifford, E. T.......................Winthrop
Decoster, Virginia........North Auburn
Dudley, A. M........................Mapleton
Dunbar, E. W.................Damariscotta
Eastman, A. A.........................Dexter
Eastman, Mrs. A. A...................Dexter
Eddy, Mrs. F. A.........................Bangor
Emery, Edward H.....................Sanford
Fairbanks, H. G.......North Monmouth
Grant, Mrs. Alanson............Lewiston
Hall, Mrs. H. A........................Brewer
Hayford, Columbus...............Maysville
Holland, George N.............Hampden
Hooper, C. A...............................Elliott
Hussey, Mrs. E. E....................Brewer
Jewell, H. W.....................Farmington
Johnson, Henry...............South Turner
Keith, Walter E......................Winthrop
Kenniston, G. A..........................Arnold
King, A. R..............North Monmouth
King, Mrs. L. M.................South Etna
King, S. M........................South Paris
Knowlton, C. H..................Farmington
Leathers, A. W.........................Bangor
Leland, H. L..............East Sangerville
Leland, W. E..............East Sangerville
Lemont, J. W.....................West Bath
Mann, Mrs. Esther A.......South Leeds
Manson, A. M................North Monroe
Merrill, G. W..............................Bangor
Merritt, E. W., Jr.....................Houlton
Miles, Dudley.........................Newburg
Moore, L. P...............................Newburg
Munson, W. M...........................Orono
Nevins, J. L..............................Lewiston
Nowell, F. E.............................Fairfield

*Deceased.

ANNUAL MEMBERS—Concluded.

Page, F. W.. ....Augusta
Pickard, Eva................ .....Arnold
Prescott, Franklin.............Newburg
Prescott, G. N.... ......East Monmouth
Prescott, J. W............. ..... Liberty
Reed, James B............Bowdoinham
Ridley, J. D... ....Jay
Ring, A. P.............Richmond Corner
Rose, Mrs. Ada E ....North Greene
Salisbury, Mrs. Amos..... .....Brewer
Sleeper, F. H. L...............Lewiston
Snow, G. W.... ....Newburg
Sprague, F. J.... ....Charlotte
Sturgis, C. G................ ......Auburn
Tarr, Edward....... ....Castle Hill
Thissell, Mrs. J. A................Bangor
Toothaker, L. P............. ...Dixmont
Waterman, Mrs. C. E.......East Auburn
Wharff, William R..............Gardiner
Whitney, G. W.......... North Newburg
Whittier, Phineas.....Farmington Falls
Wright, Fred. . ...Woolwich
Wright, L. E ... .Bath

ANNUAL MEMBERS, 1897.

Bishop, Frank I.................Winthop
Carll, E. C .... .Buxton
Fairbanks, H. N....... .... Bangor
Grant, Mrs. Benson.... ....Lewiston
Litchfield, Jennie E...........Winthrop
Stanton, Chas. B. ....Winthrop
Whittier, Phineas.....Farmington Falls
Wood, Elliott. ....Winthrop

TREASURER'S REPORT.

RECEIPTS.

From State stipend		$1,000 00
Interest:		
Farmington Water Company	$10 00	
Merchants' National Bank	12 00	
		22 00
Annual members:		
Edward H. Emery, Sanford	$1 00	
Phineas Whittier, Farmington Falls	1 00	
A. M. Dudley, Mapleton	1 00	
A. A. Eastman, Dexter	1 00	
Columbus Hayford, Maysville	1 00	
G. N. Holland, Hampden	1 00	
A. W. Leathers, Bangor	1 00	
C. A. Hooper, Eliot	1 00	
F. E. Nowell, Fairfield	1 00	
Mrs. E. E. Hussey, Brewer	1 00	
G. A. Kenniston, Arnold	1 00	
James Bickford, Carmel	1 00	
Mrs. C. C. Barrett, Brewer	1 00	
E. T. Clifford, Winthrop	1 00	
C. H. Knowlton, Farmington	1 00	
F. H. L. Sleeper, Lewiston	1 00	
J. D. Ridley, Jay	1 00	
G. N. Prescott, East Monmouth	1 00	
A. P. Ring, Richmond Corner	1 00	
F. W. Page, Augusta	1 00	
W. M. Munson, Orono	1 00	
Mrs. George F. Archer, Clifton	1 00	
Mrs. W. H. Bailey, Bangor	1 00	
S. M. King, South Paris	1 00	
Carle S. Bartlett, Bangor	1 00	
Mrs. J. A. Thissell, Bangor	1 00	
Mrs. Amos Salisbury, Brewer	1 00	
Dudley Miles, Newburg	1 00	
Franklin Prescott, Newburg	1 00	
Mrs. Louisa M. King, South Etna	1 00	
Mrs. S. L. Brimmer, Mariaville	1 00	
G. A. Kenniston, Arnold	1 00	
Gideon Andrews, Hermon	1 00	
G. W. Snow, Newburg	1 00	
W. E. Leland, East Sangerville	1 00	
H. L. Leland, East Sangerville	1 00	
L. P. Moore, Newburg	1 00	
T. W. Bartlett, East Dixmont	1 00	
Mrs. H. A. Hall, Brewer	1 00	

Annual members:

Henry Johnson, South Turner	$1 00	
G. W. Merrill, Bangor	1 00	
Mrs. C. C. Barrett, Brewer	1 00	
Miss Hattie Allen, Bangor	1 00	
J. W. Prescott, Liberty	1 00	
Mrs. F. A. Eddy, Bangor	1 00	
Carl Beers, Bangor	1 00	
Mrs. C. E. Waterman, East Auburn	1 00	
Eddie W. Merritt, Jr., Houlton	1 00	
H. W. Jewell, Farmington	1 00	
Walter E. Keith, Winthrop	1 00	
Alanson S. Grant, Lewiston	1 00	
Mrs. Esther A. Mann, South Leeds	1 00	
Mrs. Ada E. Rose, North Greene	1 00	
A. A. Eastman, Dexter	1 00	
A. P. Ring, Richmond Corner	1 00	
E. W. Dunbar, Damariscotta	1 00	
William R. Wharff, Gardiner	1 00	
A. K. Bickford, Monmouth	1 00	
Mrs. D. L. Nevins, Lewiston	1 00	
Virginia DeCoster, North Auburn	1 00	
Mrs. A. R. Ring, North Monmouth	1 00	
Abbie F. Bailey, Freeport	1 00	
J. M. Lemont, West Bath	1 00	
Fred Wright, Bath	1 00	
A. M. Munson, North Monroe	1 00	
L. E. Wright, Woolwich	1 00	
James B. Reed, Bowdoinham	1 00	
L. P. Toothaker, Dixmont	1 00	
Eva Pickard, Arnold	1 00	
H. G. Fairbanks, North Monmouth	1 00	
F. E. Nowell, Fairfield	1 00	
G. W. Whitney, North Newburg	1 00	
F. J. Sprague, Charlotte	1 00	
		$73 00
Life members:		
John H. Crowell, Temple	$10 00	
Edwin Thurston, West Farmington	10 00	
Franklin D. Grover, Bean	10 00	
Mrs. Lucy A. Chandler, Freeport	10 00	
Mrs. H. A. Hall, Brewer	10 00	
		$50 00
Eastern Maine State Fair		600 00
Maine State Agricultural Society		500 00
Cash on hand January 1, 1896		135 18
		$2,380 18

EXPENDITURES.

John W. True, President, expenses at winter meeting	$17 22
C. H. George, Executive Committee, expenses at winter meeting	22 80
A. E. Andrews, expenses at winter meeting	14 72
D. H. Knowlton, Secretary, expenses at winter meeting	30 00
Chas. E. Wheeler, Treasurer, expenses at winter meeting	19 62
Smith & Reid, binding Transactions	7 87
American Express Company, express on fruit	8 20
George H. Collins, advertising	3 00
A. E. Andrews, cash paid Augusta Safe Deposit & Trust Company, for deposit box	5 00
D. H. Knowlton, in part for salary as Secretary	50 00

Knowlton, McLeary & Company, engravings for Transactions		$18 00
Augusta Safe Deposit & Trust Company, in favor of permanent fund		228 69
J. Woodward Manning, services as judge at Lewiston		27 50
Mr. and Mrs. Chas. S. Pope, services as judges at Bangor		25 00
James M. Hayes, services as judge on fruit at Lewiston		25 00
Z. A. Gilbert, Executive Committee, expense		3 00
John W. True, President, expenses at Bangor		22 50
A. E. Andrews, Executive Committee, expenses and services at Bangor		14 50
D. H. Knowlton, Secretary, expenses at Bangor		23 83
D. H. Knowlton, postage, express, etc		17 37
D. H. Knowlton, expenses at Lewiston and cash paid out		47 50
Clerk hire, Bangor		20 60
J. K. Islam & Company, vases		2 40
Clerk hire, Lewiston		18 00
Mrs. E. M. Blanchard, decorations		25 00
Fred H. Cowan, assistant at Lewiston		10 00
C. H. George, Executive Committee, expenses at Bangor		21 80
C. H. George, as Executive Committee expenses		38 85
A. E. Andrews, Executive Committee expenses		16 18
Wood-Robinson Co., paper for tables		6 50
A. E. Andrews, Executive Committee, services at Bangor		12 00
L. B. Raynes, stenographic report of Bangor meeting		5 00
Mrs. H. A. Hall, annual membership paid back		1 00
B. Walker McKeen, framing World's Fair diploma		4 38
Knowlton, McLeary & Co., printing		55 95
Lewiston Journal, printing		11 65
John W. True, President, expenses		40 80
A. E. Andrews, Executive Committee, services		18 60
Premiums at Winter Meeting	$59 00	
Premiums at Bangor Fair	381 50	
Premiums at Lewiston Fair	912 25	
		$1,352 75
Cash in treasury January 1, 1897		88 40
		$2,380 14

PERMANENT FUND.

Dr.

To deposit in Wiscasset Savings Bank	$128 02
First National Bank, Farmington	400 00
Merchants' National Bank, Gardiner	200 00
Farmington Water Company	100 00
Augusta Safe Deposit and Trust Company	441 08
Due permanent fund	30 90
	$1,300 00

Cr.

By 125 life members to January 1, 1896		$1,250 00
life members received in 1896:		
John H. Crowell, Temple	$10 00	
Edwin Thurston, Temple	10 00	
F. D. Grover, Bean	10 00	
Mrs. Lucy A. Chandler, Freeport	10 00	
Mrs. H. A. Hall, Brewer	10 00	
		$50 00
		$1,300 00

CHARLES E. WHEELER, *Treasurer*.

CHESTERVILLE, December 31, 1896.

FINANCIAL CONDITION OF THE SOCIETY DECEMBER 31, 1896, SO FAR AS KNOWN TO THE EXECUTIVE COMMITTEE.

ASSETS.

Bounty due for State	$1,000 00
Property owned by society	250 00
Permanent fund	1,269 10
Interest (estimated)	12 00
Cash in treasury	88 40
	$2,619 50

LIABILITIES.

Outstanding orders	$125 00
Bills presented but not allowed	40 87
Other accounts, estimated	75 00
Due permanent fund	30 90
	$271 77

JOHN W. TRUE,
D. H. KNOWLTON,
A. E. ANDREWS,
Z. A. GILBERT,
C. H. GEORGE.
} *Executive Committee.*

BUSINESS TRANSACTIONS.

ANNUAL MEETING.

September 3—Met in accordance with the following call: "Annual meeting of the Maine State Pomological Society. The annual meeting of the Maine State Pomological Society, for the election of officers and the transaction of other business, will be held in the Lecture Hall, in the park, Lewiston, on Thursday, September 3, 1896, at 6.30 o'clock P. M. Per order of Executive Committee, D. H. Knowlton, Secretary.

Informal reports were made by the secretary and treasurer of the society.

Voted, That the society indorse the action of the executive committee in joining with the Eastern Maine Fair in holding an exhibition in Bangor, and that they be authorized to continue the arrangement if the terms are satisfactory to them.

Proceeded to the election of officers for the year 1897. (See page 10 for officers elected.)

WINTER MEETING.

A business session of the society was called to meet at Hotel Hamilton, Winthrop, February 17, 1897, at 7 o'clock P. M. Met according to the call.

Voted, That Messrs. Gilbert and Andrews of the executive committee audit the treasurer's account and report during the session.

Voted, That the executive committee be instructed to meet the trustees of the Maine State Agricultural Society and effect a new contract or agreement with them for our next annual exhibition.

Voted, That the treasurer's salary for the past year be fixed at $25.

The secretary submitted circular letters from the Ohio Horticultural Society, calling a convention of representatives of the State Horticultural Societies in Washington, to agree upon some uniform legislation, State and National, bearing upon the control and extermination of fungous and insect fruit pests. Tabled.

The Secretary submitted papers and correspondence of the officers of the Hamburg Horticultural Exposition, inviting our society to send exhibits, etc. Tabled.

Voted, That the premiums awarded at this exhibition be paid by the treasurer Friday afternoon.

The president was instructed to appoint committees.

February 19—Mr. D. J. Briggs in behalf of the committee on resolutions presented the following:

Resolved, That we appreciate the cordial welcome extended by the citizens of Winthrop.

Resolved, That the thanks of the society are due to the hotels of the village, and to the railroads for reduced rates; also, to the grange for their kindly assistance.

Resolved, That the thanks of the society are extended those who furnished us such beautiful music.

Mr. GILBERT—I have enjoyed this meeting very much and I think the resolutions should receive our heartiest support, and for three very good reasons: One is that we have learned again that when the citizens of Winthrop take hold of a good cause it is sure to be a success; second, that fruit growing is on the increase among our people, an evidence that culture and refinement are gaining ground, and third, that the Maine State Pomological Society can run a successful meeting when they fall into as good hands as they have in the town of Winthrop. We appreciate the assistance of those who are related to or in any way connected with that which we represent here. So we have had a successful meeting, we have enjoyed your hospitality, we appreciate the efforts of your committee, your citizens, and we heartily thank you for it.

The resolutions were then given a passage by a rising vote. Premiums were paid the last afternoon of the exhibition by the treasurer.

February 20—The committee to audit the treasurer's accounts reported that they found the same correct and had approved the same.

Voted, That the secretary be instructed to deliver Mr. Wheeler his bond as treasurer.

Voted, That the key to box in the Augusta Safe Deposit and Trust Company be deposited with the president as custodian of the same.

MEETINGS OF THE EXECUTIVE COMMITTEE.

January 18, 1896—Met at the Elm House, Auburn.

Voted, To ask the State Society for Wednesday evening of the fair for our annual meeting instead of Thursday, as last year.

Revised the schedule of premiums.

The secretary presented the following from the trustees of the State Agricultural Society:

"*Voted,* To invite the State Pomological Society to unite with this society in the joint exhibition of the year upon the same conditions as in 1895, save that the Pomological Society is to fit up and take full care of upper floor of the exhibition building, using all tables and property of the Agricultural Society already prepared for their use."

Voted, To accept these conditions for the present year.

April 29, 1896—Met at Exchange Hotel, Lewiston.

Hon. F. O. Beal, President of the Eastern Maine Fair, was present and offered the following proposition in behalf of the association he represents: "The Eastern Maine State Fair Association is pleased to extend an invitation to the Maine State Pomological Society to hold a joint exhibition with them at their grounds in Bangor on August 25, 26, 27, 28, 1896, upon the same terms and conditions as is your custom to do with the Maine State Fair Association."

Voted, That the above proposition be accepted, provided the sum be increased one hundred dollars to meet the expenses of the officers incident to holding said exhibition.

Voted, That the secretary be requested to notify the Maine State Agricultural Society of our action before giving publicity to the same, and assure the officers of that society that our action is based upon a desire to extend, so far as possible, the influence of our society in the State, and a belief that both exhibitions would be improved without prejudice to either by such action.

In response to the secretary's letter the following cordial letter was received:

KENDUSKEAG, May 4, 1896.

D. H. KNOWLTON, Esq.,

Secretary State Pomological Society:

DEAR SIR—In answer to your favor of the 1st inst., allow me to say that I understand your society will hold two fairs this year with the Maine State Agricultural Society at Lewiston, and the Eastern State Fair at Bangor, and that such will probably be the future policy of your society, am I correct? If so, I believe the arrangement a good one, calculated largely to increase the usefulness of your society, by extending its benefits to a part of the State where the interest in fruit growing is not so active as it should be. Our society will not object to the arrangement you have made with the Eastern Fair. On the contrary, we approve, in the belief that the interest you will awaken in the eastern part of the State will result in bringing to you at Lewiston larger and more varied exhibits than ever before.

Permit me to thank you for the very cordial feelings expressed towards our society and its management and to assure you that they are fully reciprocated by us.

Very truly yours,

S. G. JERRARD, President.

Voted, That further details in the premiums be referred to the secretary.

August 5, 1896—Met at Elm House, Auburn.

Voted, That the secretary be authorized to employ judges for both fairs at Bangor and Lewiston.

Voted, That the preparation of programmes for the public meetings during the fairs at Bangor and Lewiston be referred to the secretary.

Voted, That the secretary arrange for decorations at Lewiston, not to exceed $25 in cost.

Voted, That the secretary be authorized to employ assistants for the fairs.

The secretary reported that he had received a diploma and medal from the World's Fair Commission, also that Secretary

McKeen had a diploma and medal from the same source subject to our order.

Voted, To have the diplomas framed and exhibited at the fairs.

The secretary also reported the receipt of an invitation from the managers of the Hamburg Horticultural Exhibition to take part in the same.

August 27, 1896. Met in Bangor, voted that premiums, same as at Lewiston, be allowed on articles not listed in premium list of Bangor Exhibition.

September 4, 1896. Met in Maine Farmer building on the Fair Grounds, Lewiston.

Voted, To hold a meeting of the executive committee at Elm House, Auburn, September 22, 1896.

September 22, 1896. Met at the Elm House, Auburn.

The schedules of premiums awarded at Bangor and Lewiston Exhibitions were presented, and orders in favor of the treasurer were drawn for $381.50 for Bangor, and $912.25 for Lewiston.

Voted, That the Society pay express on fruit sent for exhibition at winter meeting.

Voted, To send the diploma bearing the name of the State to Secretary McKeen, and our secretary to retain the custody of the other.

December 21, 1896. Met at Elm House, Auburn.

The secretary presented invitations for the winter meeting from Winthrop Grange, Rumford Falls, Freeport, Skowhegan and Augusta.

Voted, That the location for holding the winter meeting be referred to the secretary and president.

Voted, That if found expedient the meeting be held the week beginning February 14, 1897.

After conference with parties and further consideration the president and secretary accepted the invitation from Winthrop Grange.

PREMIUMS AWARDED.

AT THE BANGOR EXHIBITION HELD AUGUST 25, 26, 27 and 28, 1896.

APPLES.

Best general exhibition of apples grown in Androscoggin county: Henry Johnson, South Turner, first, $8; D. P. True, Leeds Centre, second, $6.

Same in Aroostook county: J. W. Dudley, Castle Hill, first, $8.

Same in Cumberland county: J. W. True, New Gloucester, first, $8; T. M. Merrill, West Gloucester, second, $6.

Same in Franklin county: Herman Corbett, Farmington, first, $8.

Same in Hancock county: Mrs. S. L. Brimmer, Tilden, first, $8.

Same in Kennebec county: W. R. Wharff, Gardiner, first, $8; E. A. Lapham, Pittston, second, $6.

Same in Knox county: Willis A. Luce, South Union, first, $8.

Same in Oxford county: C. H. George, Hebron, first, $8; S. M. King, South Paris, second, $6.

Same in Penobscot county: Franklin Prescott, Newburg, first, $8; G. A. Kenniston, Arnold, second, $6; Carle S. Bartlett, third, $3.

Same in Piscataquis county: H. L. Leland, East Sangerville, first, $8; W. E. Leland, East Sangerville, second, $6.

Same in Waldo county: J. W. Prescott, Liberty, first, $8; T. W. Bartlett, East Dixmont, second, $6.

Best collection crabapples: S. C. Harlow, Bangor, first, $1; James Bickford, Carmel, second, 50c.

Best dish Baldwins: C. H. George, first, $1; W. R. Wharff, second, 50c.

Gravenstein: Henry Johnson, South Turner, first, $1; G. W. Snow, Newburg, second, 50c.

Northern Spy: C. H. George, first, $1; Henry Johnson, second, 50c.

Rhode Island Greening: Henry Johnson, first, $1; S. M. King, second, 50c.

Roxbury Russet: W. R. Wharff, first, $1; W. A. Luce, second, 50c.

Tompkins King: G. A. Kenniston, Arnold, first, $1; G. W. Snow, second, 50c.

Yellow Bellflower: E. A. Lapham, first, $1; G. W. Snow, second, 50c.

Alexander: O. L. Larrabee, West Levant, first, $1; Mrs. L. M. King, South Etna, second, 50c.

American Golden Russet: G. A. Kenniston, first, $1.

Deane: S. C. Harlow, Bangor, second, 50c.

Duchess of Oldenburg: Mrs. L. M. King, first, $1; G. W. Snow, second, 50c.

Early Harvest: Mrs. L. M. King, first, $1; W. A. Luce, second, 50c.

Fallawater: G. W. Snow, first, $1; Dudley Miles, Newburg, second, 50c.

Fall Harvey: C. A. Arnold, Arnold, first, $1; C. H. George, second, 50c.

Fameuse: W. A. Luce, first, $1; G. W. Snow, second, 50c.

Garden Royal: C. H. George, first, $1.

Golden Sweet: W. A. Luce, first, $1.

Hubbardston Nonsuch: W. R. Wharff, first, $1; W. P. Woodworth, Simpson's Corner, second, 50c.

Jewett's Fine Red: J. W. True, first, $1; Mrs L. M. King, second, 50c.

King Sweeting: Dudley Miles, first, $1; S. M. King, second, 50c.

Large Yellow Bough: Dudley Miles, first, $1; W. T. Jones, Hampden Corner, second, 50c.

McIntosh Red: Dudley Miles, first, $1; G. W. Snow, second, 50c.

Milding: D. P. True, Leeds Centre, first, $1; Henry Johnson, second, 50c.

Munson Sweet: Mrs. L. M. King, first, $1; G. A. Kenniston, second, 50c.

Peck's Pleasant: D. P. True, first, $1.

Pomme Royale: Chas. S. Pope, Manchester, first, $1.

Porter: W. A. Luce, first, $1; W. P. Woodworth, second, 50c.

Pound Sweet: L. P. Moore, Newburg, first, $1; J. W. True, second, 50c.

President: O. L. Larrabee, first, $1; S. C. Harlow, second, 50c.

Pumpkin Sweet: G. A. Kenniston, first, $1; Herman Corbett, second, 50c.

Red Astrachan: G. A. Kenniston, first, $1; C. H. George, second, 50c.

Rolfe: O. L. Larrabee, first, $1; S. C. Harlow, second, 50c.

Russell: Herman Corbett, first, $1.

Somerset: O. L. Larrabee, first, $1; Dudley Miles, second, 50c.

Stark: C. A. Arnold, first, $1; Henry Johnson, Turner, second, 50c.

Starkey: D. P. True, first, $1; C. H. George, second, 50c.

Talman's Sweet: J. W. True, first, $1; E. A. Lapham, second, 50c.

Tetofsky: D. H. Knowlton, Farmington, first, $1; C. A. Arnold, second, 50c.

Twenty Ounce: C. A. Arnold, first, $1; E. A. Lapham, second, 50c.

Wagener: Dudley Miles, first, $1; C. A. Arnold, second, 50c.

Wealthy: Mrs. L. M. King, first, $1; J. W. True, second, 50c.

Williams' Favorite: W. A. Luce, first, $1; S. M. King, second, 50c.

Winthrop Greening: D. P. True, first, $1; E. A. Lapham, second, 50c.

Yellow Transparent: S. C. Harlow, first, $1; C. A. Arnold, second, 50c.

Benoni: C. H. George, gratuity, 50c.

Chenango Strawberries: C. H. George, gratuity, 50c.

Dudley's Winter: J. W. Dudley, gratuity, 50c.

Fall Pippin: C. H. George, gratuity, 50c.; S. C. Harlow, gratuity, 25c.

Fall Jenneting: C. H. George, gratuity, 50c.

Gloria Mundi: C. H. George, gratuity, 50c.

Hunt Russet: S. C. Harlow, gratuity, 50c.

Keswick Codlin: S. C. Harlow, gratuity, 50c.

Pound: C. H. George, gratuity, 50c.

Rome Beauty: C. H. George, gratuity, 50c.

St. Lawrence: S. C. Harlow, gratuity, 50c.

PEARS.

General exhibition of pears: First, S. C. Harlow, $4; second, D. P. True, $3.

Clapp's Favorite: First, G. W. Merrill, Bangor, $1; second, Mrs. W. H. Bailey, 50c.

Bartlett: First, W. A. Luce, $1; second, Mrs. E. T. Webb, Bangor, 50c.

Belle Lucrative: First, G. W. Morrill, $1; second, S. C. Harlow, 50c.

Beurre Clairgeau: First, S. C. Harlow, $1; second, O. L. Larrabee, 50c.

Beurre Diel: First, G. W. Merrill, $1.

Duchesse d'Angouleme: First, W. A. Luce, $1.

Flemish Beauty: First, J. W. True, $1; second, O. L. Larrabee, 50c.

Glout Morceau: First, S. C. Harlow, $1.

Lawrence: First, S. C. Harlow, $1.

Louise Bonne de Jersey: First, S. C. Harlow, $1; second, O. L. Larrabee, 50c.

Marie Louise: First, Herman Corbett, $1.

Seckel: First, W. A. Luce, $1.

Shelden: First, W. A. Luce, $1; second, O. L. Larrabee, 50c.

Vicar of Winkfield: First, W. A. Luce, $1.

Winter Nelis: First, S. C. Harlow, $1; second, Mrs. E. T. Webb, 50c.

Wilder's Early: First, W. A. Luce, $1.

Eastern Belle: First, S. C. Harlow, 50c.

GRAPES.

Grapes grown in cold grapery: First, Mrs. F. A. Eddy, Bangor, $5.

PLUMS.

Best general exhibition: First, D. H. Knowlton, Farmington, $5; second, W. A. Luce, $3; third, S. C. Harlow, $2.

Bavay's Green Gage: First, D. H. Knowlton, $1; second, W. A. Luce, 50c.

Bradshaw: First, W. A. Luce, $1; second, Gideon Andrews, Hermon, 50c.

Burbank: First, W. A. Luce, $1; second, Chas. A. Miller, East Union, 50c.

Coe's Golden Drop: First, D. H. Knowlton, $1.

Green Gage: First, S. C. Harlow, $1; second, J. W. Dudley, Castle Hill, 50c.

Prince's Imperial Gage: First, S. C. Harlow, $1; second, Mrs. L. M. King, 50c.

Purple Gage: First, D. H. Knowlton, $1; second, W. A. Luce, 50c.

Red Gage: First, W. A. Luce, $1.

Guii: First, Gideon Andrews, $1.

Lombard: First, Mrs. L. M. King, $1; second, W. A. Luce, 50c.

McLaughlin: First, S. C. Harlow, $1; second, D. H. Knowlton, 50c.

Moores' Arctic: First, W. A. Luce, $1; second, Mrs. L. M. King, 50c.

Quackenbos: First, W. A. Luce, $1.

Shipper's Pride: First, S. C. Harlow, $1; second, W. A. Luce, 50c.

Washington: First, S. C. Harlow, $1; second, Gideon Andrews, 50c.

Yellow Egg: First, W. A. Luce, $1.

MISCELLANEOUS.

Orange tree in fruit: First, Mrs. E. E. Hussey, Brewer, $1.

Fig tree in fruit: First, Mrs. F. A. Eddy, Bangor, $1.

Exhibition of canned fruit: First, Mrs. Herman Corbett, Farmington, $6; second, Mrs. Francis Hoyt, Winthrop, $4; third, Mrs. G. N. Holland, Hampden, $2.

Canned Blackberries: First, Mrs. Francis Hoyt, 50c.; second, Mrs. H. Corbett, 25c.

Canned Blueberries: First, Mrs. H. Corbett, 50c.; second, Mrs. H. A. Hall, 25c.

Canned Cherries: First, Mrs. Francis Hoyt, 50c.; second, Mrs. H. Corbett, 25c.

Canned Gooseberries: First, Mrs. E. E. Hussey, 50c.; second, Mrs. H. A. Hall, 25c.

Canned Peaches: First, Mrs. H. Corbett, 50c.; second, Mrs. Francis Hoyt, 25c.

Canned Pears: First, Mrs. H. Corbett, 50c.; second, Mrs. H. A. Hall, 25c.

Canned Plums: First, Mrs. E. E. Hussey, 50c.; second, Mrs. Francis Hoyt, 25c.

Canned Quinces: First, Mrs. Francis Hoyt, 50c.; second, Mrs. H. Corbett, 25c.

Canned Raspberries: First, Mrs. Francis Hoyt, 50c.; second, Mrs. H. Corbett, 25c.

Canned Strawberries: First, Mrs. H. Corbett, 50c.; second, Mrs. Francis Hoyt, 25c.

Canned Tomatoes: First, Mrs. E. E. Hussey, 50c.; second, Mrs. Francis Hoyt, 25c.

Preserved Apples: First, Mrs. Francis Hoyt, 50c.; second, Mrs. H. Corbett, 25c.

Preserved Currants: First, Mrs. H. A. Hall, 50c.; second, Mrs. Francis Hoyt, 25c.

Preserved Cherries: First, Mrs. E. E. Hussey, 50c.; second, Mrs. H. Corbett, 25c.

Preserved Pears: First, Mrs. H. A. Hall, 50c.; second, Mrs. Francis Hoyt, 25c.

Preserved Plums: First, Mrs. H. Corbett, 50c.; second, Mrs. E. E. Hussey, 25c.

Preserved Quinces: First, Mrs. F. Hoyt, 50c.; second, Mrs. H. Corbett, 25c.

Preserved Raspberries: First, Mrs. F. Hoyt, 50c.; second, Mrs. H. Corbett.

Preserved Strawberries: First, Mrs. H. A. Hall, 50c.; second, Mrs. H. Corbett, 25c.

Assorted Pickles: First, Mrs. H. A. Hall, 50c.; second, Mrs. F. Hoyt, 25c.

Tomato Catsup: First, Mrs. E. E. Hussey, 50c.; second, Mrs. F. Hoyt, 25c.

Collection Apple Jelly: First, Mrs. H. Corbett, $2; second, Mrs. H. A. Hall, $1.

Apple Jelly: First, Mrs. H. A. Hall, $1; second, Mrs. H. Corbett, 50c.

Crab Apple Jelly: First, Mrs. H. A. Hall, 50c.; second, Mrs. H. Corbett, 25c.

Currant Jelly: First, Mrs. H. A. Hall, 50c.; second, Mrs. E. E. Hussey, 25c.

Grape Jelly: First, Mrs. E. E. Hussey, 50c.; second, Mrs. H. Corbett.

Quince Jelly: First, Mrs. F. Hoyt, 50c.; second, Mrs. H. Corbett, 25c.

Raspberry Jelly: First, Mrs. G. N. Holland, 50c.; second, Mrs. H. Corbett, 25c.

Rhubarb Jelly: First, Mrs. F. Hoyt, 50c.; second, Mrs. H. A. Hall, 25c.

Strawberry Jelly: First, Mrs. G. N. Holland, 50c.; second, Mrs. H. Corbett, 25c.

Maple Syrup: First, Mrs. G. F. Archer, Clifton, 50c.

Banana Plant: Gratuity, Mrs. F. A. Eddy, $1.

Cherries (Olivet): Gratuity, Mrs. E. E. Hussey, $1.

Russian Fruits: A fine and interesting collection was shown by the State College.

FLOWERS AND PLANTS.

Display of Cut Flowers: Mrs. Geo. F. Archer, first, $5; Mrs. F. A. Edely, second, $3.

Dahlias: Mrs. G. F. Archer, first, $1.50; Mrs. C. C. Barrett, Brewer, second, $1; Mrs. H. A. Hall, third, 50c.

Chinese Pinks: Mrs. W. H. Bailey, first, $1; Mrs. G. F. Archer, second, 50c.

Carnations: Miss Hattie Allen, Bangor, first, $1.50.

Japan Lilies: Mrs. G. F. Archer, first, $1.50; Mrs. E. E. Hussey, second, $1.

Asters: Mrs. G. F. Archer, first, $1; Mrs. H. A. Hall, second, 50c.

Pansies: Mrs. W. H. Bailey, first, $1; Mrs. G. F. Archer, second, 50c.

Zinnias: Mrs. C. C. Barrett, first, $1; Mrs. G. F. Archer, second, 50c.

Phlox Drummondii: Mrs. C. C. Barrett, first, $1; Mrs. G. F. Archer, second, 50c.

Stocks: Mrs. W. H. Bailey, first, $1; Mrs. H. A. Hall, second, 50c.

Balsams: Mrs. C. C. Barrett, first, $1; Mrs. F. Hoyt, second, 50c.

Chrysanthemums: Mrs. C. C. Barrett, first, $1; Mrs. G. F. Archer, second, 50c.

Petunias: Mrs. G. F. Archer, first, $1.

Gladioli: Mrs. G. F. Archer, first, $1; Mrs. H. A. Hall, second, 50c.

Verbenas: Mrs. H. A. Hall, first, $1; Mrs. W. H. Bailey, second, 50c.

Nasturtiums: Mrs. Jas. A. Thissell, Bangor, gratuity, $1.

Sweet Peas: Mrs. G. F. Archer, gratuity, $1; Mrs. Jas. A. Thissell, 50c.

Salpiglossis: Mrs. W. H. Bailey, Bangor, gratuity, $1.

Button-hole Bouquets: Mrs. C. C. Barrett, first, $1; Mrs. H. A. Hall, second, 50c.

Floral Pillow: Mrs. H. A. Hall, second, $1.

Floral Design: Miss Hattie Allen, first, $2; Mrs. H. A. Hall, second, $1.

Floral Wreath: Mrs. H. A. Hall, second, $1.50.

Floral Dinner Decorations: Mrs. H. A. Hall, second, $1.

Basket Wild Flowers: Ethel C. Pfaff, Islesboro, first, $1; Mrs. F. Hoyt, second, 50c.

Dried Grasses: Mrs. G. F. Archer, first, $2.

Everlasting Flowers: Mrs. G. F. Archer, first, $1.

Cut Flowers: Mrs. H. A. Hall, first, $1.50; Mrs. E. E. Hussey, second, $1; Mrs. F. Hoyt, third, 50c.

Fancy Basket Flowers: Miss Hattie Allen, first, $1.50; Mrs. W. H. Bailey, second, $1; Mrs. H. A. Hall, third, 50c.

Greenhouse Plants: Carl Beers, Bangor, first, $5.

Pot Plants: Mrs. H. A. Hall, third, $1.

Geraniums: Mrs. H. A. Hall, third, 50c.

Begonias: Mrs. E. E. Hussey, first, $1.50; Mrs. H. A. Hall, second, $1.

Tuberose: Mrs. W. H. Bailey, first, $1.

Dracaena: Mrs. H. A. Hall, first, $1.

Flowering Begonia: Mrs. H. A. Hall, first, $1; Mrs. Amos Salisbury, Brewer, second, 50c.

Exhibition of Coleus: Mrs. Amos Salisbury, first, $1.50; Mrs. H. A. Hall, second, $1.

Fuchsia: Mrs. Amos Salisbury, first, $1.

Carnation: Miss Hattie Allen, first, $1.

Single Pot Plant: Mrs. H. A. Hall, second, 50c.

Clinging Plant on Trellis: Mrs. H. A. Hall, first, $1; Mrs. C. C. Barrett, second, 50c.

AT THE ANNUAL EXHIBITION HELD AT LEWISTON, AUGUST 31, SEPTEMBER 1, 2, 3 4, 1896.

APPLES.

For best general exhibition of Apples: S. H. Dawes, Harrison, first, $15; C. I. Perley, Cross Hill, second, $10; J. D. Ridley, Jay, $5; Mrs. S. L. Brimmer, Tilden, fourth, $3.

For best general exhibition of Apples grown in Androscoggin County: Henry Johnson, S. Turner, first, $10; A. S. Ricker, Turner, second, $8; D. J. Briggs, S. Turner, third, $5.

For same in Aroostook county: E. Tarr, Castle Hill, first, $10; J. W. Dudley, Castle Hill, second, $8.

For same in Cumberland county: S. H. Dawes, first, $10; J. W. True, New Gloucester, second, $8; T. M. Merrill, Sabbathday Lake, gratuity, $3.

For same in Franklin county: M. C. Hobbs, West Farmington, first, $10; D. C. Averill, Temple, second, $8; J. D. Ridley, Jay, third, $5.

For same in Hancock county: Mrs. S. L. Brimmer, Tilden, second, $8.

For same in Kennebec county: J. Pope and Son, Manchester, first, $10; C. I. Perley, Cross Hill, second, $8; H. G. Fairbank, N. Monmouth, third, $5.

For same in Knox county: A. Butler, Union, first, $10; W. A. Luce, S. Union, second, $8.

For same in Lincoln county: H. J. A. Simmons, Waldoboro, first, $10; E. W. Dunbar, Damariscotta, second, $8.

For same in Oxford county: C. H. George, Hebron, first, $10; Lemuel Gurney, Hebron, second, $8; S. M. King, S. Paris, third, $5.

For same in Penobscot county: G. A. Kenniston, Arnold, first, $10; C. A. Arnold, Arnold, second, $8; L. P. Toothaker, Dixmont, third, $5.

For same in Piscataquis county: H. L. Leland, E. Sangerville, first, $10; W. E. Leland, E. Sangerville, second, $8.

For same in Sagadahoc county: L. E. Wright, Woolwich, first, $10; J. M. Lamont, W. Bath, second, $8; A. P. Ring, Richmond Corner, third, $5.

For same in Somerset county: J. S. Hoxie, N. Fairfield, first, $10; F. E. Nowell, N. Fairfield, second, $8.

For same in Waldo county: A. M. Mansur, N. Monroe, second, $8; T. W. Bartlett, E. Dixmont, third, $5.

Single Plates.

Baldwins: T. M. Lombard, Auburn, first, $5; D. J. Briggs, second, $3; Mrs. A. R. King, N. Monmouth, third, $2.

Gravenstein: A. S. Ricker, first, $3; T. M. Lombard, second, $2; J. Pope and Son, third, $1.

Hubbardston Nonsuch: Henry Johnson, first, $3; James B. Reed, Bowdoinham, second, $2; C. A. Arnold, third, $1.

Northern Spy: T. M. Lombard, first, $3; A. S. Ricker, third, $1.

Rhode Island Greening: C. H. George, first, $5; A. K. Bickford, Monmouth, second, $3; C. I. Perley, third, $2.

Roxbury Russets: D. J. Briggs, first, $3; T. M. Lombard, second, $2; Walter E. Keith, Winthrop, third, $1.

Tompkins King: S. H. Dawes, first, $3; C. I. Perley, second, $2; T. M. Lombard, third, $1.

Yellow Bellflower: J. M. Lemont, first, $3; C. A. Arnold, second, $2; Lemuel Gurney, third, $1.

Alexander: S. H. Dawes, first, $1; T. M. Lombard, second, 50c.

Bailey Sweet: C. H. George, first, $1; S. H. Dawes, second, 50c.

Ben Davis: C. I. Perley, first, $1; C. H. George, second, 50c.

Deane: J. M. Lemont, first, $1; J. D. Ridley, second, 50c.

Duchess of Oldenburg: T. M. Lombard, first, $1; F. H. L. Sleeper, Lewiston, second, 50c.

Dudley's Winter: J. W. Dudley, first, $1.

Fallawater: J. S. Hoxie, first, $1; A. A. Eastman, Dexter, second, 50c.

Fall Harvey: C. H. George, first, $1; C. I. Perley, second, 50c.

Fameuse: C. H. George, first, $1; A. K. Bickford, second, 50c.

Garden Royal: Walter E. Keith, first, $1; D. C. Averill, second, 50c.

Gloria Mundi (of Maine): Geo. K. Davis, Lewiston, first, $1; C. H. George, second, 50c.

Golden Russet: C. I. Perley, first, $1; A. A. Eastman, second, 50c.

Granite Beauty: D. H. Knowlton, Farmington, first, $1; J. D. Ridley, second, 50c.

Jewett's Fine Red: C. I. Perley, first, $1; Walter E. Keith, second, 50c.

King Sweeting: J. S. Hoxie, first, $1; C. I. Perley, second, 50c.

Large Yellow Bough: F. H. L. Sleeper, first, $1; C. A. Arnold, second, 50c.

McIntosh Red: T. M. Lombard, first, $1; C. I. Perley, second, 50c.

Milding: D. P. True, Leeds Center, first, $1; C. I. Perley, second, 50c.

Mother: S. H. Dawes, first, $1; J. W. True, second, 50c.

Munson Sweet: F. H. L. Sleeper, first, $1; C. A. Arnold, second, 50c.

Peck's Pleasant: J. S. Hoxie, first, $1; S. H. Dawes, second, 50c.

Pomme Royale: C. H. George, first, $1.

Porter: S. H. Dawes, first, $1; Wm. R. Wharff, Gardiner, second, 50c.

Pound Sweet: C. I. Perley, first, $1; J. W. True, second, 50c.

Primate: D. C. Averill, first, $1; S. H. Dawes, second, 50c.

Red Astrachan: S. H. Dawes, first, $1; C. H. George, second, 50c.

Red Canada: Mrs. A. R. King, first, $1; Walter E. Keith, second, 50c.

Rolfe: E. H. Libby, Auburn, first, $1; Walter E. Keith, second, 50c.

Russell: J. D. Ridley, first, $1; D. C. Averill, second, 50c.

Somerset: Wm. R. Wharff, first, $1; H. G. Fairbanks, second, 50c.

Stark: J. W. True, first, $1; D. P. True, second, 50c.

Starkey: C. H. George, first, $1; J. D. Ridley, second, 50c.

Talman's Sweet: A. S. Ricker, first, $1; T. M. Lombard, second, 50c.

Twenty Ounce: Eva Pickard, Arnold, first, $1; T. M. Lombard, second, 50c.

Wagener: T. M. Lombard, first, $1; S. H. Dawes, second, 50c.

Wealthy: T. M. Lombard, first, $1; J. W. True, second, 50c.

William's Favorite: H. G. Fairbanks, first, $1; W. A. Luce, second, 50c.

Winthrop Greening: A. P. Ring, first, $1; Walter E. Keith, second, 50c.

Yellow Transparent: C. A. Arnold, first, $1; C. I. Perley, second, 50c.

Acerbifolia: J. S. Hoxie, second, 25c.

American Summer Pearmain: S. H. Dawes, first, 50c.

American Golden Pippin: A. Butler, first, 50c.

Autumn Strawberry: A. Butler, second, 25c.

August Greening: F. E. Nowell, second, 25c.

Benoni: S. H. Dawes, first, 50; C. H. George, second, 25c.
Black Oxford: C. A. Arnold, first, 50c; A. K. Bickford, 25c.
Beauty of Kent: H. J. A. Simmons, first, 50c.
Benton Red: G. A. Kenniston, first, 50c; G. W. Whitney, N. Newburg, second, 25c.
Ballister: H. J. A. Simmons, first, 50c.
Bietigheimer: S. H. Dawes, first, 50c.
Beefsteak: A. S. Ricker, first, 50c; J. W. True, second, 25c.
Blue Pearmain: W. A. Luce, first, 50c; S. H. Dawes, second, 25c.
Caleph Sweet: J. D. Ridley, first, 50c.
Canada Baldwin: M. C. Hobbs, first, 50c.
Chenango Strawberry: S. H. Dawes, first, 50c; C. H. George, second, 25c.
Colvert: F. E. Nowell, first, 50c; A. Butler, second, 25c.
Cooper's Market: A. Butler, first, 50c; F. E. Nowell, second, 25c.
Detroit Red: C. I. Perley, first, 50c.
Eaton: H. J. A. Simmons, second, 25c.
Early Harvest: S. H. Dawes, first, 50c; W. A. Luce, second, 25c.
Fall Greening: W. A. Luce, second, 25c.
Foundling: H. J. A. Simmons, second, 25c.
Fall Jenneting: C. H. George, first, 50c; D. P. True, second, 25c.
Fall Pippin: S. H. Dawes, first, 50c; C. H. George, second, 25c.
Fall Orange: S. M. King, first, 50c.
French Russet: H. J. A. Simmons, first, 50c.
Grimes Golden: G. W. Whitney, first, 50c; D. P. True, second, 25c.
Golden Ball: C. A. Arnold, first, 50c; E. C. Douglass, W. Auburn, second, 25c.
Golden Sweet: C. H. Judkins, Chesterville, first, 25c.
Garden Sweet: E. A. Lapham, Pittston, first, 50c.
Golden Pearmain Russet: H. J. A. Simmons, second, 25c.
Haas: C. A. Arnold, first, 50c; H. J. A. Simmons, second, 25c.
Harris Sweet: S. H. Dawes, first, 50c.

Hawley: A. Butler, first, 50c.

Hightop Sweet: F. E. Nowell, first, 50c; A. Butler, second, 25c.

Holden Pippin: A. Butler, first, 50c.

Honey Pink: G. W. Whitney, first, 50c.

Hubbardston Pippin: E. A. Lapham, first, 50c.

Hunt Russet: D. P. True, first, 50c; Eva Pickard, second, 25c.

Hurlbut: A. Butler, first, 50c; W. A. Luce, second, 25c.

Jersey Sweet: A. Butler, first, 50c.

Jonathan: H. J. A. Simmons, second, 25c.

Keswick Codlin: A. Butler, first, 50c.

Kilham Hill: A. S. Ricker, first, 50c; F. H. L. Sleeper, second, 25c.

Lady Sweet: C. H. George, first, 50c; S. H. Dawes, second, 25c.

Lane Sweeting: J. W. True, first, 50c.

Lyscomb: W. A. Luce, first, 50c; M. C. Hobbs, second, 25c.

Maiden's Blush: J. W. True, first, 50c; F. E. Nowell, second, 25c.

Mammoth: J. D. Ridley, first, 50c.

Mann: G. W. Whitney, first, 50c; A. A. Eastman, second, 25c.

Marston Red Winter: A. S. Ricker, first, 50c.

Moses Wood: Wm. R. Wharff, first, 50c.

Mountain Beet: S. H. Dawes, first, 50c.

Naked Limb Greening: E. A. Lapham, first, 50c; C. I. Perley, second, 25c.

New England Beauty: C. H. George, first, 50c; A. A. Eastman, second, 25c.

Newtown Pippin: S. H. Dawes, first, 50c.

Orange Pippin: W. A. Luce, first, 50c.

Orange Sweet: J. S. Hoxie, first, 50c; C. A. Arnold, second, 25c.

Paradise Sweet: C. H. George, first, 50c.

Pennock Red Winter: W. A. Luce, first, 50c; F. E. Nowell, second, 25c.

Pewaukee: C. A. Arnold, first, 50c; J. D. Ridley, second, 25c.

Poughkeepsie Russet: A. Butler, first, 50c; C. I. Perley, second, 25c.

Pound Apple: C. H. George, first, 50c.

Pound Redstreak: H. J. A. Simmons, first 50c.

President: F. E. Nowell, first, 50c; A. S. Ricker, second, 25c.

Pumpkin Sweet: Walter E. Keith, first, 50c; S. H. Dawes, second, 25c.

Rambo: D. P. True, first, 50c; A. Butler, second, 25c.

Ribston Pippin: A. S. Ricker, first, 50c; C. A. Arnold, second, 25c.

River: J. D. Ridley, first, 50c; S. H. Dawes, second, 25c.

Rome Beauty: C. H. George, first, 50c; S. H. Dawes, second, 25c.

St. Lawrence: A. Butler, first, 50c; A. A. Eastman, second, 25c.

Scott's Winter: C. A. Arnold, first, 50c; G. W. Whitney, second, 25c.

Seek-no-further: C. H. George, first, 50c; S. H. Dawes, second, 25c.

Smith's Cider: J. W. True, first, 50c.

Sops of Wine: C. E. Wheeler, Chesterville, first, 50c; A. Butler, second, 25c.

Sour Bough: A. Butler, first, 50c.

Spitzenberg: S. H. Dawes, first, 50c; D. P. True, second, 25c.

Spice Apple: H. J. A. Simmons, first, 50c.

Subord Sweet: C. H. Judkins, first, 50c.

Superb Sweet: A. S. Ricker, first, 50c.

Sweet Russet: H. J. A. Simmons, first, 50c; J. S. Hoxie, second, 25c.

Tetofsky: C. H. George, first, 50c; J. D. Ridley, second, 25c.

Walbridge: J. W. True, first, 50c.

Whitney's Red: S. H. Dawes, first, 50c.

Winter Sweet Russet: W. A. Luce, first, 50c.

York Pippin: C. H. George, first, 50c.

Zachary Pippin: H. J. A. Simmons, first, 50c.

Crab Apples.

Marengo: A. Butler, first, 50c.

Hyslop: A. Butler, first, 50c.

Red Siberian: A. Butler, second, 25.

Lady Elgin: A. Butler, first, 50c.

Transcendent: F. E. Nowell, first, 50c; A. Butler, second, 25c.

Gen. Grant: C. A. Arnold, first, 50c.

Sweet Crab: H. J. A. Simmons, first, 50c.

PEARS.

General Exhibition of Pears: S. H. Dawes, first, $10; C. I. Perley, second, $8; Walter E. Keith, third, $5; D. P. True, fourth, $3.

Clapp's Favorite: A. S. Ricker, first, $3; A. Ricker, Turner, second, $2; S. H. Dawes, third, $1.

Bartlett: S. H. Dawes, first, $3; T. M. Lombard, second, $2; A. S. Ricker, third, $1.

Sheldon: S. H. Dawes, first, $3; W. E. Keith, second, $2.

Belle Lucrative: G. N. Prescott, E. Monmouth, first, $1; J. S. Hoxie, second, 50c.

Beurre d'Anjou: S. H. Dawes, first, $1; Walter E. Keith, second, 50c.

Beurre Bosc: J. W. True, first, $1.

Beurre Hardy: C. I. Perley, first, $1.

Beurre Superfin: D. P. True, first, $1.

Beurre Clairgeau: G. N. Prescott, first, $1; D. J. Briggs, second, 50c.

Beurre Diel: D. J. Briggs, first, $1.

Buffum: D. P. True, first, $1; C. I. Perley, second, 50c.

Doyenne Boussock: S. H. Dawes, first, $1; C. I. Perley, second, 50c.

Duchesse d'Angouleme: W. A. Luce, first, $1; S. H. Dawes, second, 50c.

Goodale: C. I. Perley, first, $1; T. M. Lombard, second, 50c.

Howell: J. S. Hoxie, first, $1; S. H. Dawes, second, 50c.

Louise Bonne de Jersey: W. A. Luce, first, $1; D. P. True, second, 50c.

Seckel: A. S. Ricker, first, $1; W. A. Luce, second, 50c.

Souvenir du Congress: S. H. Dawes, first, $1.

Lawrence: Chas. C. Gee, Lewiston, first, $1; Lemuel Gurney, second, 50c.

Beurre d'Amalis: W. A. Luce, first, 50c.

Bloodgood: S. H. Dawes, first, 50c.

Brandywine: D. P. True, first, 50c.

Dana's Hovey: S. H. Dawes, first, 50c.

Dearborn's Seedling: S. H. Dawes, first, 50c; Lemuel Gurney, second, 25c.

Doyenne White: S. H. Dawes, first, 50c.

Eastern Belle: J. S. Hoxie, first, 50c.

Edmunds: Walter E. Keith, first, 50c.

Flemish Beauty: Lemuel Gurney, first, 50c; Walter E. Keith, second, 25c.

Glout Morceau: D. J. Briggs, first, 50c; C. I. Perley, second, 25c.

Garber: S. H. Dawes, first, 50c.

Idaho: S. H. Dawes, first, 50.

Indian Queen: D. P. True, first, 50c.

Kieffer: D. P. True, second, 25c.

Nickerson: H. J. A. Simmons, first, 50c.

Osborne Summer: C. I. Perley, first, 50c; D. P. True, second, 25c.

Rostiezer: S. H. Dawes, first, 50c.

Rutter: S. H. Dawes, first, 50c.

Urbaniste: S. H. Dawes, first, 50c.

Vicar of Wakefield: D. P. True, first, 50c; W. A. Luce, second, 25c.

Wilder's Early: W. A. Luce, first, 50c.

PLUMS.

General Exhibition of Plums: W. A. Luce, first, $6; S. H. Dawes, second, $4; D. H. Knowlton, third, $2.

Abundance: C. I. Perley, first, $1; T. M. Lombard, second, 50c.

Burbank: J. W. True, first, $1; S. H. Dawes, second, 50c.

Jefferson: J. W. True, first, $1.

St. Lawrence: C. H. George, first, $1; T. M. Lombard, second, 50c.

Lombard: S. H. Dawes, first, $1; W. A. Luce, second, 50c.

McLaughlin: A. A. Eastman, first, $1; J. S. Hoxie, second, 50c.

Moore's Arctic: E. Tarr, first, $1; B. T. Townsend, second, 50c.

Quackenbos: W. A. Luce, first, $1.

Washington: H. J. A. Simmons, first, $1; D. H. Knowlton, second, 50c.

Yellow Egg: S. H. Dawes, first, $1; Lemuel Gurney, second, 50c.

Bavay's Green Gage: J. Pope & Son, first, $1; W. A. Luce, second, 50c.

Bradshaw: Lemuel Gurney, first, $1; C. H. George, second, 50c.

Coe's Golden Drop: D. H. Knowlton, first, $1.

Green Gage: B. T. Townsend, Freeport, first, $1; C. I. Perley, second, 50c.

Prince's Imperial Gage: W. A. Luce, first, $1; H. J. A. Simmons, second, 50c.

Purple Gage: B. T. Townsend, first, $1; W. A. Luce, second, 50c.

Red Gage: W. A. Luce, first, $1; F. E. Nowell, second, 50c.

Guii: A. A. Eastman, first, $1; C. H. George, second, 50c.

FRUITS IN GLASS.

Strawberries: Mrs. A. M. Eastman, Dexter, first, 50c.

Raspberries: Mrs. A. M. Eastman, first, 50c.

Gooseberries: D. H. Knowlton, first, 50c; Mrs. A. M. Eastman, second, 25c.

Currants: Mrs. A. M. Eastman, first, 50c.

MISCELLANEOUS.

Cultivated Cranberries: S. H. Dawes, first, $2.

Variety Canned Fruits, etc.: Mrs. H. Corbett, Farmington, first, $10; Mrs. F. D. Grover, Bean, second, $8; Mrs. I. L.

Nevens, Lewiston, \$5; Mrs. F. Hoyt, Winthrop, \$1.50; Mrs. A. M. Eastman, \$1.50.

Canned Blackberries: Mrs. E. A. Mann, S. Leeds, first, \$1; Mrs. I. L. Nevens, second, 50c.

Canned Blueberries: Mrs. F. Hoyt, first, \$1; Mrs. E. A. Mann, second, 50c.

Canned Cherries: Mrs. I. L. Nevens, first, \$1; Virginia, Decoster, N. Auburn, second, 50c.

Canned Gooseberries: Mrs. I. L. Nevens, first, \$1; Miss Ada E. Rose, North Greene, second, 50c.

Canned Pears: Mrs. H. Corbett, first, \$1; Mrs. A. M. Eastman, second, 50c.

Canned Plums: Mrs. H. Corbett, first, \$1; Mrs. F. Hoyt, second, 50c.

Canned Raspberries: Mrs. I. L. Nevens, first, \$1; Mrs. H. Corbett, second, 50c.

Canned Strawberries: Mrs. H. Corbett, first, \$1; Mrs. F. Hoyt, second, 50c.

Canned Tomatoes: Mrs. A. M. Eastman, first, \$1; Mrs. I. L. Nevens, second, 50c.

Preserved Apples: Mrs. A. M. Eastman, first, \$1; Mrs. F. Hoyt, second, 50c.

Preserved Currants: Virginia Decoster, first, \$1; Mrs. A. M. Eastman, second, 50c.

Preserved Cherries: Mrs. H. Corbett, first, \$1; Mrs. I. L. Nevens, second, 50c.

Preserved Pears: Mrs. H. Corbett, first, \$1; Alice True, Leeds Center, second, 50c.

Preserved Plums: Mrs. F. Hoyt, first, \$1; Mrs. F. D. Grover, second, 50c.

Preserved Raspberries: Mrs. F. D. Grover, first, \$1; Mrs. I. L. Nevens, second, 50c.

Preserved Strawberries: Miss Ada E. Rose, first, \$1; Mrs. F. D. Grover, second, 50c.

Assorted Pickles: Mrs. F. D. Grover, first, \$1; Mrs. F. Hoyt, second, 50c.

Tomato Catsup: Mrs. F. Hoyt, first, \$1; Mrs. F. D. Grover, second, 50c.

Collection Apple Jellies: Alanson S. Grant, Lewiston, first, $5; Mrs. E. A. Mann, second, $3; Virginia Decoster, third, $2; Mrs. H. Corbett, fourth, $1.

Apple Jelly: Alanson S. Grant, first, $1; Mrs. E. A. Mann, second, 50c.

Crab Apple Jelly: Mrs. E. A. Mann, first, 50c; Mrs. H. Corbett, second, 25c.

Currant Jelly: Mrs. E. A. Mann, first, 50c; Alanson S. Grant, second, 25c.

Grape Jelly: Mrs. E. A. Mann, first, 50c; Virginia Decoster, second, 25c.

Raspberry Jelly: Alanson S. Grant, first, 50c; Mrs. H. Corbett, second, 25c.

Rhubarb Jelly: Mrs. E. A. Mann, first, 50c; Virginia Decoster, second, 25c.

Strawberry Jelly: Mrs. F. D. Grover, first, 50c; Virginia Decoster, second, 25c.

Maple Syrup: Mrs. E. A. Mann, first, $1; C. H. George, second, 50c.

Maple Sugar: Lemuel Gurney, first, $1; E. E. Hardy, East Wilton, second, 50c.

Evaporated Apples: Walter E. Keith, first $3.

Exhibition of Grapes: S. H. Dawes, gratuity.

Snyder Blackberries: A. Butler, first, 50c; H. Corbett, Farmington, second, 25c.

Wachusett Blackberries: B. T. Townsend, first, 50c; H. Corbett, second, 25c.

Sunnyside Strawberries: C. W. Dexter, Auburn Heights, gratuity, 50c.

Wilder Currants: D. H. Knowlton, gratuity, 50c.

Agawam Blackberries: A. Butler, gratuity, 50c.

Taylor's Prolific Blackberries: A. Butler, gratuity, 50c.

Kittatinny Blackberries: A. Butler, gratuity, 50c.

Erie Blackberries: A. Butler, gratuity, 50c.

PLANTS AND FLOWERS.

Display of Cut Flowers: Mrs. B. T. Townsend, Freeport, first, $10; Mrs. G. F. Archer, Clifton, third, $5.

Dahlias: Mrs. B. T. Townsend, first, $2; Mrs. G. F. Archer, second, $1.

Chinese Pinks: Mrs. B. T. Townsend, first, $2.

Asters: Mrs. Lucy A. Chandler, Freeport, $1; Miss G. P. Sanborn, Augusta, 50c.

Pansies: Mrs. G. F. Archer, first, $1.

Zinnias: Mrs. B. T. Townsend, first, $1; Mrs. Chas. Stanley, Winthrop, second, 50c.

Phlox Drummondii: Mrs. B. T. Townsend, first, $1; Mrs. G. F. Archer, second, 50c.

Perennial Phlox: Mrs. B. T. Townsend, first, $2; Mrs. Lucy A. Chandler, second, $1.

Stocks: Mrs. B. T. Townsend, first, $1; Mrs. G. F. Archer, second, 50c.

Nasturtiums: Mrs. G. F. Archer, first, $1; Mrs. Chas. Stanley, second, 50c.

Sweet Peas: Mrs. G. F. Archer, first, $1; Edward H. Bickerton, Auburn, second, 50c.

Balsams: Mrs. B. T. Townsend, first, $1; Mrs. F. Hoyt, second, 50c.

Petunias: Mrs. B. T. Townsend, first, $1; Mrs. G. F. Archer, second, 50c.

Gladioli: Mrs. G. F. Archer, first, $2; Mrs. B. T. Townsend, second, $1.

Verbenas: Mrs. B. T. Townsend, first, $1; Mrs. Chas. Stanley, second, 50c.

Vase Cut Flowers: Mrs. Chas. Stanley, first, $3; Abbie F. Bailey, Freeport, second, $2; Mrs. A. Cummings, Auburn, third, $1.

Six Button-hole Bouquets: Mrs. Lucy A. Chandler, first, $2; Mrs. A. Cummings, second, $1.

Corsage Bouquet: Mrs. Lucy A. Chandler, first, $2; Miss G. P. Sanborn, second, $1.

Floral Design (Amateur): Abbie F. Bailey, first, $5; Mrs. Chas. Stanley, second, $3.

Dish of Cut Flowers: Mrs. A. Cummings, first, $2; Mrs. H. Corbett, second, $1.

Basket of Cut Flowers: Mrs. H. Corbett, first, $2; Mrs. Chas. Stanley, second, $1.

Exhibition of Pot Plants: Mrs. B. T. Townsend, first, $10; Mrs. A. Cummings, second, $8.

Exhibition Geraniums: Mrs. E. M. Blanchard, Lewiston, first, $3; Mrs. A. Cummings, second, $2.

Foliage Begonias: Mrs. B. T. Townsend, first, $2; Mrs. A. Cummings, second, $1.

Exhibition Coleus: Mrs. B. T. Townsend, first, $2; Mrs. A. Cummings, second, $1.

Fuchsias: Mrs. A. Cummings, second, $1.

Pelargoniums: Mrs. A. Cummings, second, $2.

Double Geraniums: Mrs. E. M. Blanchard, first, 50c; Mrs. A. Cummings, second, 25c.

Single Geranium: Mrs. E. M. Blanchard, first, 50c; Mrs. A. Cummings, second, 25c.

Ivy-leaved Geranium: Mrs. A. Cummings, second, 50c.

Pelargonium: Mrs. A. Cummings, second, 50c.

Foliage Begonia: Mrs. B. T. Townsend, first, 50c; Mrs. E. M. Blanchard, second, 25c.

Flowering Begonia: Mrs. E. M. Blanchard, first, 50c; Mrs. B. T. Townsend, second, 25c.

Coleus: Mrs. E. M. Blanchard, first, 50c; Mrs. B. T. Townsend, second, 25c.

Fuchsia: Mrs. A. Cummings, second, 25c.

Ever-Blooming Rose: Mrs. A. Cummings, second, 50c.

Display Cut Flowers (professional): Mrs. Lucy A. Chandler, first, $10; Calvin S. Goddard, Woodfords, second, $8; Miss G. P. Sanborn, third, $5.

Roses: Miss G. P. Sanborn, first, $5.

Carnations: Mrs. Lucy A. Chandler, first, $2; Miss G. P. Sanborn, second, $1.

Pansies: Mrs. Lucy A. Chandler, first, $3.

Collection of Floral Designs: C. S. Goddard, first, $10; Miss G. P. Sanborn, second, $8.

Floral Design (professional): Miss G. P. Sanborn, first, $5; C. S. Goddard, second, $3.

Greenhouse Plants: Miss G. P. Sanborn, first, $20; C. S. Goddard, second, $15; Mrs. E. M. Blanchard, third, $10.

Ferns: Miss G. P. Sanborn, first, $3; C. S. Goddard, second, $2.

Rose Plants: C. S. Goddard, first, \$5; Miss G. P. Sanborn, second, \$3.

Cut Wild Flowers: Mrs. C. E. Waterman, first, \$3.

Pressed Wild Flowers: Eddie W. Merritt, Jr., Houlton, first, \$5; Bertha Mabel Nason, Houlton, second, \$3; H. W. Jewell, Farmington, third, \$2.

WINTER MEETING.

Held in Winthrop, February 17 and 18, 1897.

APPLES.

Exhibition of Apples: B. H. Ridley, Jay, first, \$5; Phineas Whittier, Farmington Falls, second, \$4; J. W. True, New Gloucester, third, \$3.

Baldwins: F. I. Bishop, Winthrop, first, \$1; Chas. B. Stanton, Monmouth, second, 50c.

Ben Davis: Geo. L. Gott, Wayne, first, \$1; J. W. True, second, 50c.

Dudley's Winter: E. Tarr, Castle Hill, first, 50c.

Fallawater: E. F. Purington, W. Farmington, first, 50c; A. A. Eastman, Dexter, second, 25c.

Fall Harvey: D. J. Briggs, S. Turner, first, \$1; S. L. Merchant, Winthrop, second, 50c.

Fameuse: O. L. Larrabee, W. Levant, first, 50c; W. P. Atherton, Hallowell, 25c.

Golden Russet: C. A. Arnold, Arnold, first, 50c; A. A. Eastman, second, 25c.

Granite Beauty: E. F. Purington, first, \$1; B. H. Ridley, second, 50c.

Hubbardston Nonsuch: Mrs. L. K. Litchfield, Winthrop, first, \$1; W. P. Atherton, second, 50c.

Mann: G. N. Prescott, Monmouth, first, 50c; Mrs. J. McAllister, W. Lovell, second, 25c.

Jewett's Fine Red: Phineas Whittier, first, \$1; W. P. Atherton, second, 50c.

McIntosh Red: Phineas Whittier, first, 50c; E. F. Purington, second, 25c.

Milding: B. H. Ridley, first, \$1; O. L. Larrabee, second, 50c.

Mother: Chas. S. Pope, Manchester, 50c.

Northern Spy: Phineas Whittier, first, $1; F. I. Bishop, second, 50c.

Pound Sweet: B. H. Ridley, first, $1; J. W. True, second, 50c.

Rhode Island Greening: E. F. Purington, first, $1; Phineas Whittier, second, 50c.

Rolfe: Hartwood Little, Brunswick, first, 50c; W. P. Atherton, second, 25c.

Roxbury Russets: Chas. B. Stanton, first, $1; C. H. George, Hebron, second, 50c.

Starkey: D. J. Briggs, first, 50c; C. H. George, second, 25c.

Stark: E. H. Bickerton, Auburn, first, 50c; J. W. True, second, 25c.

Talman's Sweet: Phineas Whittier, first, $1; B. H. Ridley, second, 50c.

Tompkins King: C. I. Perley, Cross Hill, first, $1; H. G. Fairbanks, N. Monmouth, second, 50c.

Wagener: F. I. Bishop, first, 50c; D. J. Briggs, second, 25c.

Yellow Bellflower: J. W. True, first, $1; Mrs. J. McAllister, second, 50c.

Spitzenberg: D. P. True, Leeds Center, first, 50c; Mrs. F. D. French, Winthrop, second, 25c.

PEARS.

Beurre d' Anjou: Mrs. J. McAllister, first, 50c; D. P. True, second, 25c.

Duchesse de Bordeaux: C. I. Perley, first, 50c.

Vicar of Wakefield: D. P. True, first, 50c.

MISCELLANEOUS.

Domestic Canned Apple: Mrs. F. Hoyt, Winthrop, first, $1; Mrs. L. K. Litchfield, second, 50c.

Collection Apple Jellies: Mrs. Benson Grant, Lewiston, first, $3; Mrs. F. D. Grover, Bean, gratuity, $2; Mrs. L. K. Litchfield, gratuity, $1.

Apple Jelly: Mrs. L. K. Litchfield, first, $1; Mrs. Benson Grant, second, 50c.

Cranberries: A. C. Greenleaf, Farmington, first, $1; G. H. Perley, Winthrop, second, 50c.

Evaporated Apples: Phineas Whittier, first, $1.50; W. E. Keith, second, $1.

SUMMARY OF AWARDS.

Bangor exhibition		$381.50
Lewiston exhibition:		
Apples	$476.50	
Pears	69.50	
Plums	40.50	
Miscellaneous	89.75	
Flowers	2.36	
		$912.25
Winter exhibition, Winthrop		59.00
		$1,352.75

PUBLIC MEETINGS

OF THE

Maine State Pomological Society.

PAPERS, DISCUSSIONS, Etc.

PUBLIC MEETING,

Council Chamber, City Hall, Bangor, August 26, 1896.

ANNUAL MEETING,

Lewiston, September 3, 1896.

WINTER MEETING,

Winthrop February 18 and 19, 1897.

Noble common fruit, best friend of man and most loved by him, following him like his dog or his cow, wherever he goes. His homestead is not planted till you are planted, your roots intertwine with his; thriving best where he thrives, loving the limestone and the frost, the plow and the pruning-knife, you are indeed suggestive of hardy, cheerful industry, and a healthy life in the open air. Temperate, chaste fruit! you mean neither luxury nor sloth, neither satiety nor indolence, neither enervating heats nor the frigid zones. Uncloying fruit, fruit whose best sauce is the open air, whose finest flavors only he whose taste is sharpened by brisk work or walking knows; winter fruit, when the fire of life burns brightest; fruit always a little hyperborean, leaning toward the cold; bracing, sub-acid, active fruit. I think you must have come from the north, you are so frank and honest, so sturdy and appetizing. You are stocky and homely like the northern races. Your quality is Saxon. Surely the fiery and impetuous south is not akin to thee. Not spices or olives or the sumptuous liquid fruits, but the grass, the snow, the grains, the coolness is akin to thee. I think if I could subsist on you, or the like of you, I should never have an intemperate or ignoble thought, never be feverish or despondent. So far as I could absorb or transmute your quality I should be cheerful, continent, equitable, sweet.—*John Burroughs.*

PUBLIC MEETINGS.

PROGRAMMES.

BANGOR, AUGUST 26, 1896.

This meeting was held in Council Chamber, City Hall, at 7.45 o'clock, P. M. The exercises consisted of a short address of welcome to the city of Bangor by Mayor Beal, and brief remarks by Prof. Munson, Chas. S. Pope, the Secretary and others.

ANNUAL MEETING IN LEWISTON, SEPTEMBER 3, 1896.

Programme was informal consisting of election of officers, and impromptu remarks.

WINTER MEETING.

WINTHROP, February 18 and 19, 1897.

PROGRAMME.

Wednesday Evening—Business meeting of the society. Report of treasurer. Report of secretary.

Thursday A. M.—Tables will be in readiness for display of fruit, which must be properly entered and in place before 1 o'clock P. M. Address of welcome, J. Henry Moore, Winthrop. Response. President's annual address, John W. True, New Gloucester.

Afternoon—Music. The Russets of Maine, Z. A. Gilbert, North Greene. Discussion. The Introduction of Russian Fruits in America, Prof. W. M. Munson, State College. Discussion. Music. Small Fruits for Home Use, L. F. Abbott, Lewiston. Discussion. Music.

Evening—Music. Jelly Making, Alanson S. Grant, Lewiston. Music. Fruit as Food, not Luxuries, Miss Anna Barrows, Boston. Music.

Friday A. M.—Principles Involved in Marketing, Phineas Whittier, Farmington Falls. Discussion. The Home Market, W. H. Keith, Winthrop. Discussion. Shipping Fruit, W. P. Atherton, Hallowell. Discussion. The Foreign Market, Alfred W. Otis, Boston. Discussion.

Afternoon—Music. Hardy Roses—varieties—culture, Ernest Saunders, Lewiston. Discussion. Music. Plant Study—Its Importance in Horticulture and Agriculture, Prof. Lew M. Felch, Houlton. Discussion. Currants and Gooseberries, Prof. W. M. Munson, State College. Music.

Evening—Music. Some Scale Insects, Prof. F. L. Harvey, State College. Discussion. Music. Days with our Birds (illustrated), Mrs. Kate Tryon, Cambridge, Mass. Music.

ADDRESSES AND DISCUSSIONS.

AT THE BANGOR MEETING.

President True called the meeting to order and said:

Upon the passage of the law giving the Maine State Pomological Society an increase of its stipend from the State treasury, your officers, after paying its outstanding indebtedness, began to look around to see in what way it could extend its usefulness in lines that have been already employed, and while different plans were being discussed Mayor Beal came before us and made the proposition that our society should take charge of the Pomological Department of the Eastern Maine State Fair, and he offered such inducements that the executive committee accepted them, and we have been very much pleased. The time was short for us to make arrangements, but we have been very much pleased with the reception we have received from the officers and managers of the fair and the people of Bangor and vicinity and our society feels that it has no excuse for being except to spend this money that is entrusted to them in improving fruit culture, beautifying our homes, making them the typical homes of Maine and the world.

The President then called upon Mayor Beal, who spoke as follows:

MAYOR BEAL'S REMARKS.

Mr. Chairman, Ladies and Gentlemen:

On behalf of the city of Bangor, the Eastern Maine State Fair and the Fair community generally, I extend to the Maine State Pomological Society a cordial welcome.

The chairman has said there seems to be no better way for the Maine State Pomological Society to spend the stipend than to extend its influences throughout the State, and inasmuch as we never have had them here before in this part of the State to any extent, it seems to me that this was a proper time for them to come east and join with us, assist us what they could. The influence of the Maine State Pomological Society must be great, must be of a great deal of good to the whole State, but it could not be unless it took in nearly the whole State, extended its branches out. And I hope the seed that has been sown here at this time will take root and be fruitful to the extent that the Maine State Pomological Society may feel that it is not only a pleasure to them to come this way, but a duty that they owe the citizens east of the Kennebec river. We never have, in this part of the State, taken so much interest in pomology as we should, but I hope this will wake us up, wake up the farming interests. I have no doubt it will. They have a grand show down to the grounds this year—much better than I anticipated was possible—and the way they have conducted the affairs of the society down there it seems to me must be fruitful of good, and I hope, as I said before, that this will not be the last meeting by any means that will be held by the Maine State Pomological Society, but that it is only the beginning of a bright future for our farming community in this part of the State.

I do think that there is no better way that the State can spend a small amount of its money raised by taxation than by putting it into the hands of this society. They do not put in enough. They should put in more, that it may be used, and I am sure that it is used, to the best advantages of everybody. And I hope the legislature this winter will see to it that the Maine State Pomological Society has the assistance that it should have from the whole State and the treasury of the State, and if there is any way that I can assist in their having it, I shall be pleased to do so.

Thanking you for the attention you have given me and for the coming this way of the society, I hope to meet you in the future many times.

Secretary KNOWLTON. Mr. President: It may perhaps be a little informal to say anything directly in response to what Mayor Beal has said. He has gone over the ground quite fully, explaining how it happened that we saw fit to come here this year to conduct this part of the exhibition. We have talked this matter over, the officers of the society, many times among ourselves, but we somehow felt a little shy about approaching people over this way, because we felt somehow that if they wanted us to come they would ask us, and so we contented ourselves with simply doing the exhibition work that we have been doing; but little by little the field seemed to enlarge and the organization which our society has for exhibition and other purposes is such that we could do better work than could be done here without any special fruit organization behind it. There seemed to be a propriety in Mayor Beal inviting us to join with them as well as a propriety in our accepting the invitation. We, as the executive committee of the society, saw fit to accept the proposition without consulting the members of the society, because there was no opportunity of doing it this year and the arrangements were such with the officers of the society here that it did not seem necessary for us to get any opinion of the members; in fact, it was not possible to do it at the time, and the season was so far advanced that it seemed to be emphatically necessary for the officers to take action at once. And just here—perhaps it is entirely proper that I should say it, because there are several of our exhibitors here who are likely to call for the explanation—the fact is when the matter was closed up between the two organizations, the premium lists for the exhibition here had been quite largely distributed, and when the matter of the revision came before us we looked the matter over very carefully, and we said just like this: Now quite a lot of these premium lists are out, and this is about the way the fair has been conducted in the past, and until we know more about it ourselves we had better let that arrangement alone. And that is why the premium list, the arrangement of it, and the amount of premiums and everything of that kind stands just as it was first announced. Well, now, we expected there would be necessarily some little friction arising from misunderstandings, misapprehensions, etc., but we felt that time would determine just what should be done and if our relations continued with this society, as I certainly hope they may, we may be able to more fully meet the wants of fruit-growers and the public in making exhibitions here.

This exhibition work on our part is somewhat peculiar because the purpose which we have in view is a little different from that for which most of the societies, or a good many of the societies are run. Now our society is run entirely, or supposed to be run entirely in the interests of the State, and it is proper it should be so, because our receipts come almost entirely, or very largely, from the State, so that while we put in attractions at various points to give our exhibitions completeness, at the same time we feel like doing all the educational work possible along the ordinary highway of fruit culture; and I can assure you if you could know the various ways in which the society is called upon to answer questions and to take a hand in the department of fruit-culture, you never for a moment would question the usefulness of the society, and you would only regret that there could not be placed in the hands of the society an amount of funds that would enable it to reach more fully over the State so as to cover all the interests of fruit culture present and prospective.

Mr. Munson—I have no formal paper to present before the society to-night. I would like to make just a few remarks about the future of our society. It seems to me we have here in the line of the remarks of our worthy secretary, we have here a society which is essentially for the fruit-growers of the State. It is composed of the leading growers and pomological workers in our State, and the question arises, "How are we going best to make the society serve the ends for which it was organized?"

It seems to me first of all that we must have an ideal in mind. Our society, as already suggested, receives a certain amount of money from the State. It owes a certain duty to the State. Our responsibility does not end with the annual exhibition, or even with the annual meetings. It is our duty as a society, as progressive men, to raise the standard of practice in pomological work, and for that reason it seems to me that the educational feature of the society should be emphasized. I say this with a full recognition of the very valuable labors that our officers have been putting forth for a number of years. We all recognize the earnest efforts which Secretary Knowlton has put forth to raise the standard of the work of the society, and as I look into this new report I can say that I am proud of the showing which the report of this society makes as compared with that of the other leading State societies. There are very few of the State societies which send out a report which will rank higher than that of our own. But I say we must come to the support of our officers and make our meetings specially educational in their nature so far as it is possible for us to do.

Now there has been in the past a certain amount of complaint made at some of the rulings of our experts that we get here from other states, at some of the rulings of our fruit committees, in reference to the exhibits. They cut pretty close home sometimes. But what is the reason for that? There is not a man here, I am sure, who does not, if he stops to reason with himself, recognize that there is a principle behind all that. Your committees will say that fruit is not up to a standard of excellence, and it is our business, our duty, as loyal members of the society, to raise that standard of excellence, and I am glad to say that the standard is very much higher now than it was five years ago. I say it is our duty to raise the standard and show the people what varieties, if we come to a study of varieties, are valuable for our State; to refuse to grant gratuities to unworthy varieties, and to compel observance of the rules of the society as laid down. This then is one of the educational features.

Another of the educational features is to get at some of the reasons for our work, to study methods of culture, disseminate varieties and communicate ideas. At the present time the business man, the man with a broad training, is the one who "gets there" if I may be allowed such an expression. It is not the man that knows simply how to cultivate fruits, but it is the man who knows how to market. As I go into our fruit stores in the city of Bangor, I find the California fruits everywhere,—I find our Maine fruits nowhere. Why? Because they are not suitably packed.

Now, gentlemen, the one thing which we as progressive growers must learn to do if we are to hold our own with the California growers, and with those of some of the older states, is to learn to pack, learn to use attractive packages, to put our fruit on the market in good shape. I go here to fruit stores and they say "Why we have some very nice California fruit." Why is that so much nicer than our own? Oh, well, the California people put theirs up in good shape. The dealers recognize the importance of packages and they know what the people must have. We have a very good illustration of the importance of this good packing in the Hales Georgia Company, our most noted New England orchardists perhaps. They started in the fruit business some twenty years ago and marketed their crop from a push-cart. At the present time they have hundreds of acres in fruits and market them, not by the carload, but by the trainload. Train after train is sent out with this fruit, and largely because there has been some gumption shown, because there has been some push put into the marketing, and not because they are able to raise any better fruit than you and I are.

Well, now, when I came here a few years ago there was a great demand for work along certain experimental lines. The horticultural department of the College was established with the idea of working in connection with the Maine State Pomological Society. Gentlemen, I should be glad to know how the horticultural department of the College can best serve the interests of the pomologists of the State. We are always glad to do what we can for the society and we are always glad to receive members of the society there.

Now I will simply say that during the coming winter—I do not wish to make this an advertisement of the Maine State College, but I would say that we are going to have a course in horticulture, and if you have any boys, or your neighbors have any boys that have any idea of following in your business, of taking up horticultural work—send them along. May be we can do something that will help them. We are going to have a course in fruit growing and in vegetable gardening; we are going to have some work in the propagation of plants, in the growing of plants under glass, in the study of fertilizers for fruits and the study of the chemistry of plants, and try to teach young men something about the plants they are working with, and give them if possible some enthusiasm in the direction of horticultural work.

Mr. POPE—Mr. Chairman, ladies and gentlemen: I have simply made a few notes, and therefore I will just give you a little informal talk, a few of my ideas, and emphasize also what Prof. Munson has said about sorting and packing.

There has probably been enough said upon this topic, but you will remember this like everything else must be repeated over and over again before we can get our people to pay any attention to it. But now you will remember this season, you will take note the reports are that we are to have an immense crop of fruit all over the country, and unless we are going to take a little more pains, we are going to get a mere nothing in return for what fruit we market, and it is a pretty serious question with us this year where we shall market our fruits.

I can't advise people who never have had any experience to pack up their fruit and ship it to England, because England is a little short. Do we understand the method of packing for a foreign shipment? If not, we certainly shall make a losing game. It is a point, and a very nice point to pack fruit so that it will reach England in such shape as to give us any return over and above expenses. There has already been sent thousands of bushels this fall of our soft fruit; nearly all of it is reported slack. A very few barrels on the whole have paid for the expenses. One reason is the fruit was too soft, to be sure; but take it with our winter fruit: If your apples are not packed closely they certainly will rattle and be reported "slack." And I think that they take an undue advantage of us over there, as the apples, you all know, were sold at auction and bid off in twenty barrel lots or over. The price there may be quite satisfactory, but when the buyer goes down to the store-room below if he can find any of that lot that is the least loose, he is going to cut down two or three, four or five shillings on a barrel, and just as many of them as is possible and probably a great many that he ought not to. If those barrels are packed too closely, one is jammed into the other and that breaks the skin; it begins to rot, and you are just as bad off as though you had packed them loosely. Therefore, unless you are thoroughly conversant with the methods of packing, let some of the rest take the risk—let those who have experience.

But is it not time—I am not going to discourage those who are willing to come up and do a little experimental work—is it not time that we did some of this shipping ourselves and learned the proper methods, and not give the profits to the middle-man. Now our Canadian neighbors—I believe they are sharper than the Yankees are—we pride ourselves on being pretty smart, but from the reports that I get the Canadians are looking after this sharper than we are; they are getting better prices for their fruit; they are shipping this season their fall fruit, their soft fruit, in cases made purposely, in compartment cases like those we ship eggs in here, pasteboard, each apple occupying a compartment by itself. They are taking more pains in sorting their fruit, as the Southerners do in sorting their oranges. Apples of one size only are put in each box. Not all the number ones are put into one box, but the large ones are put in one box, and the smaller size are put in another box, so that they run even throughout. And when you stop to think, you know how much better the oranges look in that way, and how much better our apples would be and how much higher price they would bring than in a mixed lot—to say nothing of putting the number twos and cider apples in the center of the barrel, as some do.

If England should take as many or twice as many as they did the last year, the last time we had a big crop, when they took about a million and a half barrels, it would seem but a drop in the bucket with the crop that we have this year, therefore we had better keep our number twos at home any way.

Then the question comes up in answer to the question "Where shall we market our fruit?" What varieties have we? What shall we send abroad? What shall we sell here? It makes a wonderful difference to us what our crop is. If we have a bright red apple that will stand up well, they are ready to take it across the water; but our softer fruits and green fruits had better be kept at home. We do not take quite pains enough to study our markets. If we have "Gravensteins," Boston is ready to take those. If we have "Nodheads" the Boston buyer says, "We are not well enough acquainted with them, don't want them up here." Portland wants them. If we have the "Starkey" apple, Bath says: "We know what that is. We will take them." The "Maiden Blush" Boston is ready for, New York or Philadelphia, because they know it. Therefore let us study our markets more if we wish to get rid of these varieties which we cannot ship. Your little markets here will take a few barrels,—I know how it is with us in Augusta and in Lewiston,—put in a few barrels of a certain kind and they glut the market, take that same apple and ship it to Boston and we can get twice or three times as much if it is a variety that they are acquainted with. Therefore, find out before you ship your apples what market wants that variety and make a little more of a study of the market.

Prof. MUNSON—I would like to ask whether any members of the society have tried any of these small packages, tried putting up fancy fruits in fancy packages.

Mr. KNOWLTON—Mr. President: The matter has been discussed once or twice before our society and some fruit growers in the State have been sending fruits in a new style package, hoping that they might get better returns from it. But some of those fruit-growers whom I happen to know have not done the job well, they have taken a great deal of pains to wrap the apples, but some of the apples were not very good. The consequence is they didn't get good returns. Now the secret of the thing is, if I understand it, to get a choice apple in the market in prime condition. When you do that you are going to get good prices, whether you wrap it or don't wrap it. Of course you can't expect for culinary purposes to do quite as you would for dessert purposes. Something Prof. Munson alluded to here,—you go about the city here most any time except winters, a surplus of autumn fruit and it is hard work finding good apples; but oranges enough come from California; you find bananas enough that come from Cuba or somewhere else a good ways off that will sell for less than you can get apples,—and worse than that you can't get any good apples. Well, now, I hope that the way may be opened for more choice apples for dessert use in our local markets; and I wish there might be a little combination among our large growers to have a few choice Gravensteins always in the local markets where they can be got at during the season of Gravensteins, and so on with some of the other varieties, so that whatever may come, whatever may happen to the markets with reference to fruits in California there will always be some of the best Maine apples there that a fellow can get to eat. And I tell you one thing, if they could always get a good apple that you could rely on before you touched it, these two cent peaches on the street that come all the way from California wouldn't be much used.

Mr. E. M. BLANDING—It has been a pleasure to me to be with you to-night and to listen to the remarks made by gentlemen who have devoted long years of study to the culture and development of fruit. Certainly the fruit history of this State of Maine is one of great prominence and its future is of exceptional promise. The Maine State Pomological Society has done a grand work, but there is a great field of usefulness still before it.

I have watched with considerable interest the history in recent years of your society and I know something of the efficient labors its officers have rendered. It is gratifying to have you come to this section of the State. I know that the society's membership is more largely composed of persons from the central and western parts of the State and I know it has not been especially convenient perhaps for you to come down this way, and I know furthermore that we of this section have not perhaps tendered invitations as cordially as we should. I remember not many years ago when you held your winter meeting in Bangor, and I know that session was very interesting and profitable. I am glad that President Beal of the Eastern Maine Fair has arranged with your society to take charge of the exhibits here and I hope that arrangement will be continued, and if so I am confident that the fruit interests of this section will be materially advanced.

I have given some personal thought and investigation to fruit culture in the orchard of my own home. I have found that the summer and early fall fruits are not to be handled very readily,

—I mean to say to raise more than you can find use for at home,—and therefore all my recent plantings have been of winter fruit. And I believe that an orchard of winter fruit is to be preferred to an orange grove in Florida or on the Pacific slope. I have visited both Florida and California and am somewhat familiar with the fruit interests in those sections and I believe that Maine has a great future before it as a fruit-raising State. In Southern California a few winters ago I heard a gentleman offer a dollar for a Maine apple. Therefore it is evident that right in the heart of the greatest fruit-growing section of this continent the Maine down-east fruit is known and appreciated. Gentlemen, I believe you are engaged in a grand work and I wish you God-speed.

AT THE WINTER MEETING.

ADDRESS OF WELCOME

By J. Henry Moore, Winthrop.

Mr. President and Gentlemen of the Maine State Pomological Society:

In behalf of the members of the Winthrop Grange and in behalf of the citizens of the good town of Winthrop I extend to you a cordial welcome.

We thank you for so promptly accepting our invitation to hold the winter meeting of your society with us. You will pardon me for what possibly may seem to you at first view, a needless mention of this little town of Winthrop. I think its history is closely blended, in an agricultural point of view, with the history and existence of the various agricultural societies in our State.

We are told by our fathers, who were the pioneers of this locality, long known as Pond Town, that more than a century ago, meetings were held, and an association formed to elevate the laborer and the calling of the husbandman.

We are told that the young men of those days began to look on farming as rather a low employment—their aspirations were for something higher—forgetting that this was the original employment of man, and that all other occupations are sustained by it. They held that the position of a farmer was not very honorable, albeit Holy Writ said to them "The profit of the earth is for all; the king himself is served by the field."

The results were so satisfactory and gave such promise of success that the members were induced to apply for an act of incorporation, which was granted by the legislature of Massachusetts February 21, 1818.

I hope you will not deem it arrogance when we claim to be the pioneer county and town in forwarding the great work of agricultural pursuits.

Winthrop was the first town in New England and second in North America to form an agricultural society, somewhere about 1787.

It is no trivial honor to enjoy the merit of being the parental stock from which indirectly sprang into being the Maine State Pomological Society which you, gentlemen, represent here to-day.

We very well remember that in this very hall, in the good old town of Winthrop, what proved to be the society which you represent, first saw the light.

The State Board of Agriculture (always solicitous for the advancement of the interests entrusted to its care,) took the matter into serious consideration.

It was found that there was need of a permanent, active and thorough organization, which should operate by systematic agencies in all parts of the State, and upon all classes of the people; teaching them that while the successful cultivation of fruit may require more skill, care and patience, and a higher degree of intelligence, than that of ordinary farm crops, yet that the requisite attainments are within the reach of all cultivators of the soil.

All these considerations and needs of the farmer being in the minds of the members of the Board of Agriculture of the State led them to present the expediency of the attempt to organize such a society to the people of the State, with more than usual formality.

At the meeting of the Board at Skowhegan in October, 1872, previous notice having been given, the subject was considered, but owing to the small attendance, it was thought best "after discussion" to leave the matter in the hands of a committee, and Z. A. Gilbert, J. A. Varney and A. L. Simpson were appointed that committee.

That committee, prior to the next meeting of the Board, issued an "address to the fruit growers of Maine" which was published in the papers of the State, inviting them to meet in convention at the next meeting of the Board, to be held at Winthrop January 14-17, 1873.

In accordance with this invitation, a considerable number of persons interested in the subject met at the time and place designated. The first day of the session was devoted to the consideration of the subject proposed, and after full discussion it was voted "That it is expedient to establish such a society" and a committee was appointed to report a plan of organization and nominate officers for the society.

The committee reported, recommending that the society should be known as the Maine State Pomological Society, and designating the following persons as officers:

Z. A. Gilbert, President, East Turner; George W. Woodman, Vice President, Portland; A. L. Simpson, Vice President, Bangor; George B. Sawyer, Secretary, Wiscasset; J. C. Weston, Corresponding Secretary, Bangor; C. S. Pope, Treasurer, Manchester. Executive Committee, the President and Secretary, ex-officio; Samuel Rolfe, Portland; James A. Varney, Vassalboro and Albert Noyes, Bangor.

The report of the committee was accepted by the convention, the effect of this acceptance was simply to designate certain persons who might thereafter associate themselves together, and with others proceed to organize the society, under the sanction of the Board of Agriculture. Another committee was appointed to procure an act of incorporation for the society, (the legislature then being in session) who attended to that duty.

The corporators of the society met at Augusta in Meonian hall on the 27th day of March, 1873, accepted the act of incorporation, adopted by-laws, embracing the form of organization proposed at Winthrop and elected officers who had been there nominated.

They also elected Hon. Hannibal Belcher of Farmington member of the Board of Agriculture in behalf of the society. Chose delegates to the meeting of the American Pomological Society to be held in Boston in September, then following, instructed the ex-committee to make arrangements for an autumn exhibition of fruits and flowers.

Thus we see that Winthrop is the birthplace of this society and it seems eminently fitting that you hold your winter meeting in this town, and once more mingle with its people, who are ever ready to help on a good cause, who put their shoulder to the wheel in 1873 and said organize such a society as will make us better orchardists. That will make us plant new orchards, that would teach us to take care, cultivate and prune at such a time, and in such a way that we might reap an abundant harvest of the very best varieties of fruits and fully developed to perfection if such a thing is attainable.

The Maine State Pomological Society is now very nearly twenty-four years old. What a vast amount of good has been accomplished in those twenty-four years. Looking back over the past I can see in my mind the old orchard, but not a grafted one bearing lots of fruit year after year of no good only to make up into cider for which a good price could be obtained to be drank as a beverage thereby lowering the standard of a community in which this practice was carried on. But how changed the scene, as we look upon it to-day after these years of meeting together and discussing methods and practices one with the other. We find the old orchard grafted, new ones set out, and the sentiment of the people unite in saying unless a tree is a grafted one it is of no earthly use. Forty years ago there was but little grafting done, most orchards were bearing fruit in the natural state. In my own neighborhood only one farm could be called an orchard farm. This farm known as the Major Wood farm, now owned by W. H. Keith, produced in 1863, ten years before the Maine State Pomological Society was formed about 500 barrels of apples, while other farms equally as good on the same road produced from fifteen to fifty barrels a year.

In those days we had no foreign market and even if we had there was no apples to send away. Bangor at that time offered a market for any surplus fruit, holding the same position at that time to Maine, that Aroostook does to-day. I remember in my young days the idea held by the people was that pears could not be raised in Maine, even if it were possible, it must be in the extreme southern section of York county.

Time brings its changes, but some active agency will always help along in the matter. So we can see in the formation of the Maine State Pomological Society ten years later that a new interest had been awakened, and the people of the State were alive to starting of orchards, grafting what trees they had to varieties best suited to locality, soil, and market.

But what a change has taken place, and practically we might say within the limit of time of the existence of this society, but most certainly it would date back no further than where we read of a similar society formed in 1847 but for some reason it was short lived and without doubt no great advancement was made in the early years in the cultivation of fruit.

Those same farms that then produced the small number of barrels in a year, now produce from 200 to even as high as 1,000 barrels in a single year. And where for miles in a good farming section only a single pear tree be found and that of very ordinary fruit, now we find almost every farm or garden with its pear trees and every family is supplied with this toothsome fruit.

Not only has the apple and pear come into general cultivation but plums, strawberries, blackberries and most all kinds of fruits that can be grown in our Maine climate, are successfully raised for the family and the market.

What has wrought this great change? What agency has been employed to bring about this happy consummation? Is it not the meeting together year after year, in a gathering of this kind, giving to each other their experience, successes, as well as failures, and then the printing of your transactions being spread amongst the people over the State to be read of all men, and the theories, and the practices, there advocated utilized to their advantage and future prosperity?

The crop of apples in 1896 was without doubt the largest ever produced in New England; the quality the best, and the selling prices the lowest, while at the same time we have a grand reputation in the foreign market that Maine apples sell from two to three shillings per barrel more than apples of other New England states. Gentlemen, do not be discouraged, but rather take courage. Think no longer that Maine is a good place to emigrate from, for we have as good soil, as good a climate, and can enjoy God's blessing on our paternal acres, dotted over with fruit trees and vines bearing fruit not excelled by any state in the Union.

Most of the old landmarks or pioneers of these ancient gatherings of which I have mentioned have crossed over the river, but their record which is left us is a bright spot upon the page of history; and the generations that follow, will look back with pride upon its ancestry.

I see before me some of those men who started with this society and who having put their hand to the plow never turn back but have looked steadily forward to the goal for which this society was formed. May they feel that their labors have not been in vain, but that the knowledge imparted by this society has been a blessing to mankind and will continue to the end of time.

The first president of this society, Hon. Z. A. Gilbert, one of Maine's most practical agriculturists, "the farmers' friend." We remember him as the efficient secretary of the State Board of Agriculture for many years, always laboring for the good of the people. Holding the interests of the farmers of Maine, entrusted to his care, as sacred as his own. Always looking forward for their prosperity and happiness. Long may he be spared to give us words of counsel and wisdom.

As citizens of the town of Winthrop we thank you for the honor conferred in holding this winter meeting of your society with us; and in return we assure you that everything will be done to make this meeting one of the best ever held in the State; and that your stay with us be pleasant and remembered.

The blessings of life men count o'er and o'er,
  As they come from a hand so divine,
Yet none in the land, oh, farmer, I ween,
  But envy the joys that are thine.
The broad, level acres we look on with pride,
  The herds in the pasture that graze,
But dearer to all, both on farm and in town,
  Is the rosy-cheeked fruit that we raise.

In spring time how eagerly watch we the trees,
  As the green, pink, and white hues unfold,
And as nature so generously scatters the bloom,
  Great orchard bouquets we behold.
And then the bright summer with heat and with rain,
  Will render her aid to the trees,
So when the ripe apples in autumn are picked,
  Like old friends, we recognize these.

The Russet, Ben Davis, and Greening we prize,
  For the profit that from them we gain,
And at home or abroad what will gladden the eyes,
  Like the fair red-cheeked Baldwin from Maine!
No matter if people have different tastes,
  Such varieties of apples we find,
That with ease we select what will please every one
  Both in size, color, flavor and kind.

You may boast of the orange, lemon or peach,
  Ye men in the fair sunny lands,
But the coat of them each must be taken away
  Before eating, Dame Nature demands.
Then let us not envy our brothers abroad,
  Their products their soil can afford,
But rather for dear old New England's rich land
  And its fruit, send our thanks up to God.

I bid you God speed in your beneficient work. To such hospitality as we have, and such attentions as we can bestow, we welcome you.

RESPONSE.

By D. H. Knowlton.

I have listened with deep interest to the cordial welcome extended to us by Mr. Moore, and I assure you I fully appreciate this welcome, for the good people of Winthrop are earnest in whatever they set themselves about. Then again there is a peculiar feeling that comes over the members of the society, for as we are told by the speaker, we are to-day once more in the cradle of infancy. Yes, we are once more back to the place of our birth, no longer babes wrapped in swaddling clothes as you sent us forth many years ago, but strong in the strength of vigorous manhood. When our labors were begun here there were only a few men in Winthrop who were growing fruit for market; to-day there are nearly 300 Winthrop farmers who have surplus fruits in their cellars. More than this we find that the good old town of Winthrop raised about 27,000 barrels of apples in 1896. What is true of this town is also true of other towns in the State, so that at this time there are many thousand barrels of apples in the State ready for the market. When our work began as a society the market was only a local market, that is, a market in this country, but so widespread has fruit culture become in the United States that although the local market is large it is not sufficient to consume all our fruit, and the indications are that approaching three million barrels of apples will go to foreign markets. In this it may be well for us to note that when our Maine apples get there in prime condition they lead the list, and right here there comes in the prospect of finding a good market for our fruit at all times. Give the Maine apple a fair chance and place it in the hands of honest packers and we have nothing to fear. The low prices of fruit this year may be a sort of blessing in disguise, for it gives thousands of people in remote parts of Europe an opportunity to test the merits of our fruit in their own homes. So it is in the markets the higher we get the broader is the horizon. With lower freights and improved facilities for storing and shipping fruit, more and more the markets of the world are going to be open for Maine fruit.

Let us remember that its good name is largely in our own hands.

But on this return to our birthplace I should be remiss in my duty if I failed to call your attention to the very large increase in the production of small fruits. When we went forth from your midst, years ago, there were many in Maine who scouted at the idea of growing small fruits. Some said there were enough and to spare upon our hillsides, and others said they would not thrive. Through the influence of the agencies at work in the State there are none to-day who question our ability to grow small fruits. Where there was one farmer then who raised strawberries there are now scores, and thanks to the good work that is still going forward the number is increasing. The same is true in the culture of flowers. More flowers are grown in Maine and the end is not yet. Before our meeting is through we shall illustrate by our speakers some of the flower study that is having its influence in our schools, and the influence is a good one, for when you teach a child the name of a plant or flower and get him to studying it you have revealed to him a field of unlimited pleasure which he will be only too glad to enjoy. Nature study, the school people call it, is now being talked about by the teachers and school officers, and they are intelligently seeking out the best method of teaching the great principles of vegetable life.

I have spoken to you of these things briefly to show you how rapidly along the chosen lines of our work as a society the State has been advancing, but for all this when we look into the future we can see that the work is only begun, and that the increase of knowledge calls upon us for more work and for more intelligent work. But the fruit growers of Maine, as I see them represented here before me to-day, have no idea of turning back, and as the burdens are laid upon them there comes the increased power of bearing them, and increased ability to aid others in the great work before them. Sure, the more we know of the good things God has given us in this world and the more we know how to enjoy them ourselves, and the more we do to aid others in enjoying them, the more there is to live for and the greater is the divine light with which our lives are filled.

I thank you heartily for this very cordial welcome you have so freely tendered us, you will expect from us more than in the years gone by, and I can assure you we have relaxed no effort to bring you the best things there are in fruit culture. However much you may enjoy our meeting I can assure you we shall be made equally happy by being among you again. Again, I thank you for your greeting, and in behalf of our society promise you the best we can bring for your entertainment.

THE PRESIDENT'S ANNUAL ADDRESS.

By JOHN W. TRUE, New Gloucester.

Ladies and Gentlemen:

It is pleasant for us to meet the people of Winthrop at this the annual winter meeting of the Maine State Pomological Society. We are again assembled at the place of its birth in 1873, and it is well for us to look back and see the steady growth of our society from that time until the present.

Then we were few in numbers, but strong in the faith that by hard work, good could be accomplished; and it was all hard work, for they had little money to "grease the ways" at that time, and until recently we have had but $500 per year from the State. The balance of all the funds the society has paid out, for premiums at our annual fairs, for speakers at all of our meetings and all the expenses of the society have come as the result of our own efforts. Now we are receiving $1,000 annually from the State, and we have succeeded in paying all the indebtedness to our permanent fund, which amounts at the present time to $1,300, the interest of which goes towards our annual expenses. It is our earnest hope and charge to our successors that, if it is possible for them to honorably avoid it, they shall never again encroach upon that fund; and there should be an earnest effort made to induce more of our fruit-growers and fellow-citizens to become life members of the society, as that is the only way for us to enlarge our permanent fund, or at least, it is the only way in which it has been accumulated. In other states, similar organizations have been the recipients of donations and bequests, but I fear it will be a long time before our society will be so fortunate, therefore we must depend upon our own efforts to secure more life members and in that way to obtain better results, as every new member means another thoroughly interested person added to our number.

Our last winter meeting was held at Presque Isle, Aroostook county. The question was raised as to the advisability of going so far north to hold a fruit meeting, but the farmers of that section are realizing that they should give more attention to other crops besides the potato, and as our State stipend comes from every portion of the State it would seem to be our duty to try to assist, as far as possible, all sections, and it will probably be shown during this meeting, as it was a year ago, that apples can be raised in nearly all parts of our State.

Last spring the officers of our society received an invitation from the president of the Eastern Maine State Fair, to take charge of the fruit and flower department of their exhibition, and the terms of the invitation were such that it was thought advisable to do so. Their premium list had already been made up, and a portion of them distributed, therefore it was not deemed best to make changes in it. Your officers went into a strange building, with new surroundings, and many of the exhibitors were strangers; as it was so early in the season the fruit was very immature, but with that exception the exhibition passed off very smoothly, and if dates can be satisfactorily adjusted, we think the arrangement had better be continued.

It has been suggested that perhaps it would be well, considering the fact that the State Agricultural societies hold their annual exhibitions at so early a date that our fruit is not up to its best estate, for our society to hold the autumn exhibition by itself, at a time when the fruit has fully matured. The present would be a good time to talk the matter over and arrive at some conclusion upon the subject.

There is one matter to which I would like to call attention; I may have done so before, but if I have, it will bear repeating. While the subject of "good roads" is being so extensively discussed and plans made for improving our highways, let us see how little additional expense it would be to have our roads lined with shade trees. Let all road commissioners, or those having charge of roads, save a line of trees on either side at suitable distances from each other, and by talking the subject up, farmers and others owning land may be induced to set out different varieties where there are not already young trees started to select from, so that in years to come our highways may be made more pleasant for the passer-by. As it is now in many places the bushes and young trees grow close up to the drive-way, which causes the roads to be wet a long time after rains and in the spring and fall, and it seems as if it were almost necessary that a law be passed compelling towns to keep their roadways clear, from line to line, and in doing so have an eye to the future. It may be a little off the general line of our subjects, but there is no reason why we may not discuss it, as it will tend to make our towns and home surroundings more inviting to ourselves, our young people and the public generally. We hope at some future meeting to have one or more papers taking up this line of thought.

A full programme has been provided for this meeting touching upon different subjects, to be followed by discussions. They are all of deep interest to the fruit grower and consumer alike, therefore we will not mention them at this time, but turn to some points that may not be brought up at any other time during the meeting, but are still subjects of interest to all fruit growers.

Eighteen hundred and ninety-six has passed, and with its passing many changes have taken place, some of which have been in the line of fruit culture. Questions have arisen that were not anticipated one short year ago. Then the question was what shall we do to prevent the apple scab? and the subject of spraying was the one to receive attention, and there was also its companion, the trypeta pomonella, or apple maggot. Both of these pests, as also the codlin moth, are taking a rest for the present, but we must not for a moment think that either of them has left us. "In time of peace prepare for war." Now is the time for us to prepare to fight the apple scab and to study into the ways of the apple maggot and find a point of attack from which we can hope to carry his little fort. In one of our late papers I saw a prescription or formula entitled "Manure for Orchards," by Andrew H. Ward, and I will insert it here for future reference as in the direction pointed out may be the solutionof the little trypeta problem. At least we would like to have our professors at Orono give their opinion in regard to it.

"MANURE FOR ORCHARDS.

"The following mixture contains nitrogen, phosphoric acid and soda, and has proved destructive to all grubs and worms that either live in the ground or go into it in order to pass through the pupa state and come out as full-fledged flies to work their devastation on fruit and foliage, and there lay their eggs for the perpetuation of their kind: Five hundred pounds quicklime, 300 pounds common salt, 300 pounds powdered phosphate lime, 100 pounds nitrate of soda. The quicklime should be slaked, the salt then mixed with it and allowed to remain for some thirty days for chemical changes and combinations to take place, in the meantime being shovelled over three or four times to have it intimately mixed. Then mix with it the powdered phosphate of lime and nitrate of soda.

"The mass then is ready for use, and will cost about $8. Use 1,000 pounds of this mixture per acre, and spread broadcast on the orchard. It can also be used on lawn, meadow or pasture in the same quantity.

"The use of this mixture not only increases the quality of the fruit, but also gives the fruit a better flavor, a higher quality and larger size, and puts the tree in vigorous condition for future yields. The ingredients can all be easily procured in any quantity at market prices, and the mixing can be done on the farm. It does not deteriorate in quality by keeping.—Andrew H. Ward."

We should not forget that the little pest, in all probability, has not left us, and we should continue the only practical method of fighting it, which is to keep all windfalls closely picked up and either fed directly to stock or thoroughly destroyed in some way.

The scab I am not so clear about, but it appears to be the general opinion of those people who have given the subject the closest study, that we should spray our orchards at least twice each season; but when apples rule as low as they have this season, and the expense of spraying is added to the cost of producing the crop, and we consider the other fact, that those who have done no spraying have, as a rule (there may be exceptional cases) produced as fine fruit free from scab and worms as could be desired, it would seem as though the proper course to pursue would be to try a few trees each year, for the present, keep an exact account of the cost and watch the results. Then if it will pay on a few trees, for a series of years, it will pay to go through the whole orchard. It may be one of those things which we have to guard against, as we guard against the loss of our buildings or other property by fire, a kind of insurance.

There are many farmers and fruit growers who are seeking information regarding the fertilization of their orchards without the aid of barn dressing and if possible we would like to have it brought out at this meeting in plain terms if anyone knows what it is; just what to buy, where it can be found, how to mix it, if it requires mixing, how much to apply and how to apply it. Information covering the points suggested will be appreciated by the farmer who cannot see his way clear to keep up the fertility of his farm as it should be, and still care for the orchard. The low price that has ruled for apples the past season will probably have a tendency to cause those having the care of trees to neglect them, claiming that good care does not pay; but such is not the case. This is an exceptional year. The probabilities are that in one short year from now the Baldwin apple will be at a premium; few fruit growers, we apprehend, will be at a loss to find a place to put the crop or find trouble in disposing of it. Therefore we must give close attention to the trees, see to it that they are properly pruned and fertilized, retop the varieties that are not paying a profit in ordinary years, if they have a suitable stock, if not, cut them out in most cases, as the fruit grower as well as the general farmer of the future will be obliged to look after such things, and lop off all branches and stop all practices that do not pay, in order to succeed.

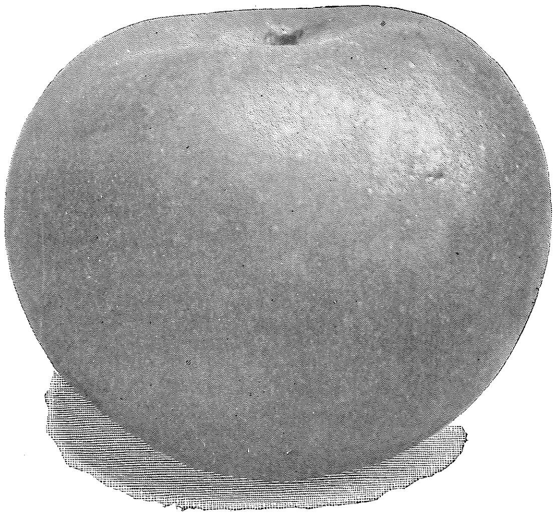
We would like to again call the attention of our society to the subject of holding a summer meeting. It would seem to us that more attention should be given our earlier summer fruits. Our State is thoroughly adapted, both in soil and climate, to the raising of many of the small fruits in their highest perfection, and there are few things that we raise from the soil that give greater satisfaction in a family than an abundance of strawberries and raspberries of the various sorts, black-caps, reds, yellow and last but not least, the Schaffers' Colossal; then the currant, gooseberry, blackberry, and the numerous kinds of plums, including a few Burbanks,—all this will serve to fix the attention and affection of the young people upon rural affairs and farm life, and even if they leave the farm for other pursuits, it will be a pleasure in all their after life to look back to so pleasant recollections as such scenes will afford. Therefore such a work as this calls for more attention. There are many things which might be said in this connection. Our society embraces the subject of flowers as well as fruits, and we should offer encouragement all along the line, as it all has a tendency to make our homes more pleasant, and we should strive to make them typical homes, so that the homes of Maine may be taken as an example not only for our own country but for the whole world to follow.

THE RUSSETS OF MAINE.

By Z. A. Gilbert.

There are many varieties of Russet apples grown in this State. Much confusion has existed among fruit growers over the names of the different varieties of these Russet apples. This is plainly shown at the annual exhibitions of this society. The officers frequently and sometimes the judges employed to award the prizes, are confused over the nomenclature of this class of fruit. At our last autumn exhibition, of a dozen or more plates in one class there were but two true to name as assembled in the space assigned. To aid somewhat in bringing something of order out of such confusion is the purpose of this paper.

In the very start, however, of our effort to classify and name the different Russets grown, the difficulty is encountered that the authorities on fruit nomenclature are in a measure puzzled and mystified over this matter, as our growers and exhibitors have been. This is the case from Samuel Cole down through the whole list to the present time. Hence studying the fruit books does not lead us out of the woods. The only course, then, is to study the fruit itself. This I have attempted to do in so far as it could be done in one season. The course taken has been to visit as many fruit shows as possible in the time and



ROXBURY RUSSET. See page 77.

take note of the different varieties of Russets on exhibition and the name under which they were shown. I have also solicited samples from the growers. Several important varieties were secured in this way, and I wish at this time to extend thanks to those who so promptly complied with my requests. So much, however, was not accomplished in this way as was desired. I wished to secure samples of all the different kinds of Russets grown in the State, but failed in meeting my desires in this direction in full.

As a matter of fact the varieties of Russets of special commercial value are quite limited in number; and those of any considerable merit for home use are still less. It is not the superior value of these apples that gives the inducement for attention at this time. So long as they are grown and put in their appearance annually at the exhibitions and on the market, we want to know their names and their merits. Were it not that the Roxbury Russet is freakish about the soil in which it thrives I am not sure but this one variety would be the only one of the name that could be recommended to the attention of growers; and even this, in the later developments of fruit interests has been shorn of a large measure of its importance. One other kind added would fill the measure of Russets that have merit sufficient to render them of special value.

LIST OF RUSSETS.

The names of the different kinds of Russets found in the fruit books are as follows: Roxbury Russet; English Russet, or Poughkeepsie Russet; Golden Russet (of Western New York); American Golden Russet; Hunt's Russet; Fletcher Russet; Red Russet; Win's Russet, or Win Russet; Kennebec Russet; Pomme Grise, which is not a Russet by name but plainly so in characteristics.

It is on the first four named that our growers get badly mixed. In this attempt to set them aright I will speak of them separately.

ROXBURY RUSSET.

It would seem that everybody ought to know so common an apple as this long time favorite. Yet they do not, for every year in our exhibitions we have more or less of Roxbury Russets misnamed, and still more frequently have other varieties of Russets erroneously labelled this kind. The Roxbury Russet has characteristics so marked and so plainly different from any other Russet that once carefully noted it need never after be mistaken. More for the purpose of showing that other kinds are not this, than the identification of the one being described, the illustration herewith, photographed from a sample expressly for the purpose, is given.

All the books substantially agree in their description of this variety. Cole's American Fruit Book, though old, is one of the best for this State, so I copy a description from that:

"Rather large; flattish; Yellow Russet, rarely a faint blush; stem medium, slender, in a rather shallow cavity; calyx closed, in a moderate basin; flesh greenish-white, rather dry when fully ripe, slightly acid and pleasant. Pretty good for cooking, not first-rate for dessert. Late winter, spring and early summer. A moderate grower and great bearer, in a moist, strong, rich soil. Important from its late keeping. Origin, Roxbury, Mass."

The importance of this apple on account of its late keeping, from a commercial standpoint, is not as great as was formerly the case. For reasons that I will not now stop to discuss the extremely late keeping apples do not now bear the increased price, as the season advances, that they did years ago. I think I am correct in the statement that this variety is not being planted out in new orchards to any considerable extent at the present time. Still it is the best, all things considered, Russet apple we have, and among the best, if not the best, late keeper in the whole list. Its large size gives it a value over all other Russets.

This apple, though so common, has been known under several different names from time to time. Last fall when at the International Exhibition at St. John, with Secretary Knowlton, we found a Russet apple in several Nova Scotia collections labelled "Nonpareil." We also found the Roxbury Russet in some of the same collections. Our interest was awakened, and being desirous of gaining information from any source available, we investigated the matter as clearly as we were able. The apples were not fully matured, but in that condition we could not find any distinction between the apples shown under the two names, nor could we get any satisfactory information on the matter from the exhibitors. We concluded that the Roxbury Russet generally goes under the name of "Nonpareil" in that province, and that showing the two plates under different names was a sly dodge of the exhibitor to get another prize. Later on I obtained samples of the "Nonpareil" direct from the Annapolis Valley, and have them on exhibition here, and I think you will all call them the true Roxbury Russet.

A curious fact in this connection I run across last fall for the first time. That is that there are two kinds of this well-known apple grown here in Kennebec county. I have this from good authorities. While the apples are closely identical, the trees differ essentially in type. It is not at all improbable that a fruit closely identical with that of the parent tree may have sprung from some one of the Russet orchards of this vicinity. Such facts are on record with some other varieties.

ENGLISH RUSSET, OR POUGHKEEPSIE RUSSET.

In our effort to describe, distinguish and identify this variety the confusion of Russet nomenclature begins to be encountered. This variety so closely resembles the Golden Russet (of Western New York) that very few of our Maine fruit growers have been able to distinguish one from the other, or in fact to positively identify either. Downing, Barry and Thomas all describe it in their works, all giving it the same name I have used here. Their descriptions also all agree. Downing alone figures the outlines of the fruit. His description is as follows:

"English Russet is a valuable long-keeping variety, extensively cultivated, and well known by this name. It is not fit for use until February, and may be kept till July, which together with its great productiveness and good flavor, renders it a very valuable market fruit."

"The trees grow very straight and form upright heads, and the wood is smooth and of a reddish brown. Fruit of medium size, roundish, slightly conical, and very regularly formed. Skin pale greenish yellow, about two-thirds covered with russet, which is thickest near the stalk. Calyx small, closed, and set in an even, round basin, of moderate depth. Stalk rather small, projecting even with the base and pretty deeply inserted in a narrow, smooth cavity. Flesh yellowish white, firm crisp, with a pleasant, mild subacid flavor. Good, January to May."

Thomas's American Fruit Culturist gives the same name, and almost identical description. The habit of growth of tree is the same. In regard to keeping it adds: "Keeps through the spring, and often through summer for twelve months."

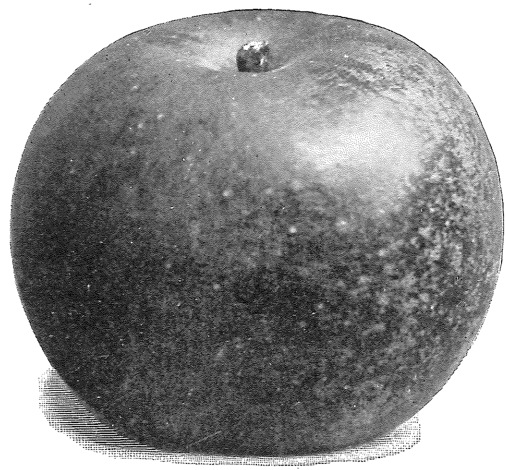
Barry in Fruit Garden gives same name and identical description, and adds: "Tree is remarkably stout and erect, bears large crops, and the fruit will keep a year." None of them figure the fruit but Downing.

It is seen that these authors all agree as to the form of growth of the tree, and the long keeping of the fruit. At St. John last fall I found a barrel of this variety a year old on exhibition at a fruit store, and in a sound and well preserved condition.

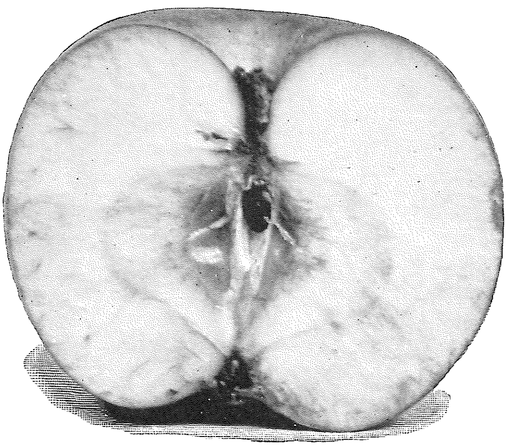
A striking feature in identifying this variety is the growth of the tree. It will also be observed that the fruit is generally only partially covered with russet. The color, also, is only a greenish yellow, while the flesh is greenish white or only tinted with yellow, but never of a rich golden color like some other of this class of apples. "The stout, thick limbs and branches of the trees are filled with spurs which are stuck full of fruit clear to their junction with the trunk, which renders it an enormous producer. This peculiarity is not found with any other variety with which I am acquainted, and is enough of itself alone by which to identify the variety.

An apple has been grown under the name of English Russet to a considerable extent in western Penobscot county and was also frequently found a few years ago in Waldo county. In the early years of our society this apple usually put in its appearance at our exhibitions, where I became familiar with it. It is emphatically distinct from the English Russet of the books described above.

This apple is medium in size, slightly conical; color green ground splashed with russet, mostly covered around the stem end, and with bronze cheek in the sun; flavor a rasping sour, early in season, tempering down to some extent later on, but never rich or high flavored; flesh greenish white. Especially liable to wither after being stored. The shape of the apple



GOLDEN RUSSET (of Western New York). See page 81.



closely resembles the American Golden Russet, but is easily distinguished from that by its inferiör quality. The variety is not being propagated at the present time.

In response to a request for a sample of this variety I received the following letter:

CHARLESTON, November 4, 1896.

Z. A. GILBERT,

Dear Sir:—Yours of 30th ult. received asking for sample of English Russet apple. Mr. Place of whom you speak was my brother-in-law. He grafted that variety extensively in this vicinity, and especially in this or my vicinity, very much to our damage. I have grafted over many of the trees of that variety in my orchard and am thinking of grafting all of them next spring. Some of them are quite large.

Mr. E. G. Lord, Mr. Place's son-in-law, says he shall graft all of his English Russet trees next spring, mostly to the Stark.

The Russets must go, for there is no sale for them when taken from the trees, and in a very short time they wither badly.

Respectfully yours,

A. W. KING.

GOLDEN RUSSET (OF WESTERN NEW YORK).

This apple closely resembles in shape and general appearance, as seen at our autumn exhibitions, the English Russet just under consideration, and is very frequently confounded with it. It has been extensively introduced in this State through New York nursery stock. Thomas describes it as follows: "Size medium, roundish and usually a little oblong, sometimes slightly flattened, nearly regular; surface sometimes wholly a thick russet, and at others a thin broken russet on a greenish yellow skin; stem slender, from half an inch to an inch long; being longest on the oblate specimens; flesh fine grained, firm, crisp, with a rich aromatic flavor. Shoots speckled; tree rather irregular. Keeps through winter. "This," he adds, "is distinct from the English Russet of straight upright growth and a very long keeper."

The twigs of this tree are long, slender and prudent, the lower branches when loaded with fruit frequently droop to the ground. The slender drooping twigs generally hold an apple grown from the terminal bud.

Another feature giving a slight distinction of this variety from the English Russet is that the stem is shorter and the cavity in which it is set is not so deep as in that variety. The calyx also is in a broad shallow basin.

The most marked distinction between the two varieties, however, is the difference in the habits of growth of the trees.

Judging from the fruit alone after taken from the trees, so closely alike are their workings, even critical judges are liable to get confused over them. (See cut.)

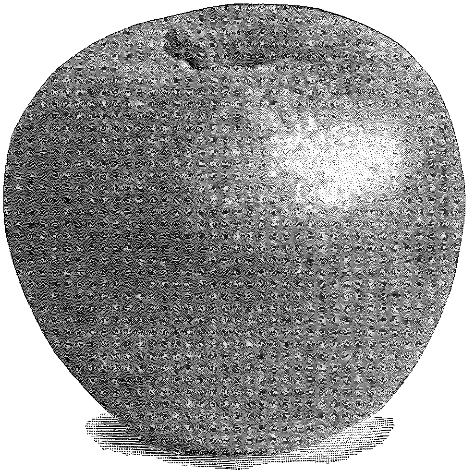
The Golden Russet proper is the variety usually found. It is extensively grown all through the central and southern parts of the State and is found at our exhibitions in nearly every large collection.

So nearly alike are the two varieties in merit as well as in features and in workings that nothing serious would in any way result if either one is mistaken for the other. Even the distinction in the keeping characteristics, recorded by the several authors, in a measure disappears here in Maine, since both varieties carry well down to summer and as long as green apples retain a sprightly flavor that renders them desirable.

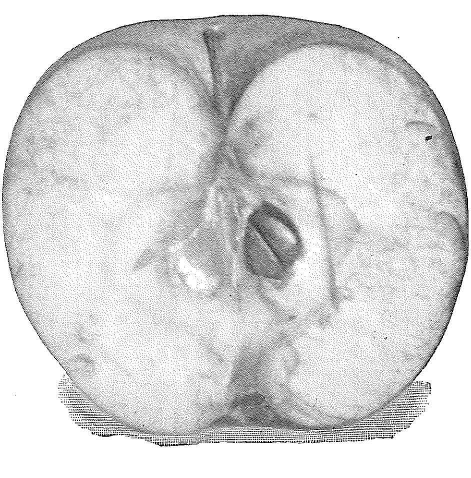
AMERICAN GOLDEN RUSSET.

With this old name, more than with the fruit, there has been dire confusion at our exhibitions, and of course, the same has been carried home with the growers. Because of its ancient and honorable name, I take it for granted, for I know of no other plausible reason, this variety has been kept on our lists, while the Golden Russet has been excluded. All the while it is the Golden Russet chiefly that has been grown and shown. As a matter of fact but very few indeed of the American Golden Russet have ever been grown in the State. I know of only two places in the State where this last named is now grown and in both cases they are in fruit gardens, introduced there on account of the specially fine quality of the fruit. The recent action of our society therefore in giving the Golden Russet a place in our list is a step in the right direction, the reason for which is apparent.

The American Golden Russet is noticed in all the fruit books, but is outlined only in Downings. Cole describes it as follows: "Small, roundish-ovate; dull yellow and russet, reddish in the sun; remarkably tender, of a rich, high spicy flavor. Season



AMERICAN GOLDEN RUSSET. See page 82.



winter and spring. One of the very best but lacks size for the market." He gives the origin as the Hunt farm, Concord, Mass. It is a question whether Cole has not confounded the place of origin with another russet apple which originated on the Hunt farm. Barry gives its origin as New Jersey. Downing says it "is one of the most delicious and tender of apples," and "best" in quality.

As distinguished in form from others of our common russets it is pearman shaped, that is, it is elongated and tapers towards the eye. This form easily distinguishes it from other of the russets. Another distinctive marking is the red cheek, which on specimens fully exposed to the sun here in Maine sometimes amounts to well marked stripes. The season in southern Maine is January. (See cut.)

I am thus particular in describing this variety more to show that other russets are not this kind, than to give the American Golden Russet any distinction or recommendation. In fact in these days of a multiplicity of varieties and a plentiful supply the only merit this variety has is its high quality as an eating apple, and when the Ben Davis will outrank our juicy and delicious Greenings and Bellflowers, rich flavors are of not much account.

The specimens shown here, and from which the cut was made, were from the garden of the late Henry Ingalls of Wiscasset. In forwarding them Mr. Ingalls wrote: "The only distinction that I observe in comparison with Downing is the length of the stem. But this I believe is a somewhat uncertain test.

The late R. H. Gardner sent some specimens from my trees to Mr. Downing in the lifetime of both and the latter pronounced them the true American Golden Russet."

HUNT'S RUSSET.

As Downing has it, or Hunt Russet, as it is frequently written, is a variety of quite long standing, originating on what has been designated as the Hunt farm in Concord, Mass. In response to a request sent to Hon. E. W. Wood, chairman of the fruit committee of the Massachusetts Horticultural Society. I received the samples on exhibition, specimens of which have been photographed. (See cut.) Accompanying the fruit was the following letter:

WEST NEWTON, October 13, 1896.

Z. A. GILBERT, Esq.

Dear Sir:—I sent you yesterday by express one dozen Hunt Russet apples. I got them from William H. Hunt of Concord, Mass., who owns the farm where this apple originated. I asked him to select the fruit from the original tree if he could, but they were all picked and the fruit from several trees mixed.

There is another russet grown from seed by John Fletcher of Acton, Mass., and he has named it Fletcher Russet. It was first shown at the Bay State Fair in Boston, some four or five years ago and attracted much attention and has been quite largely grafted by our apple growers in this State and we have put on our premium list. William H. Teele showed some very good specimens at our last exhibition and I have no doubt would furnish you specimens if you wish; he lives at West Acton, Mass.

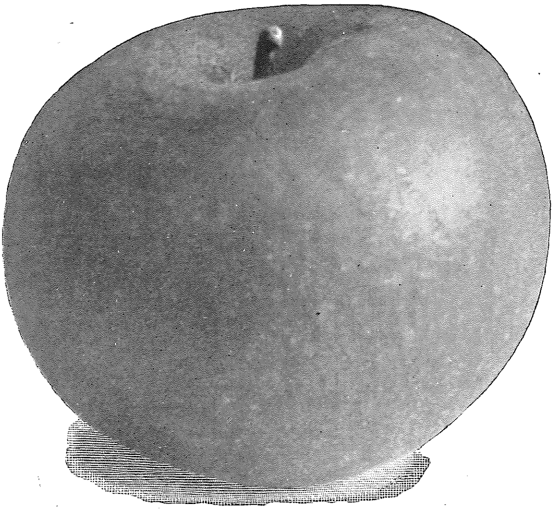
Yours truly,

E. W. WOOD.

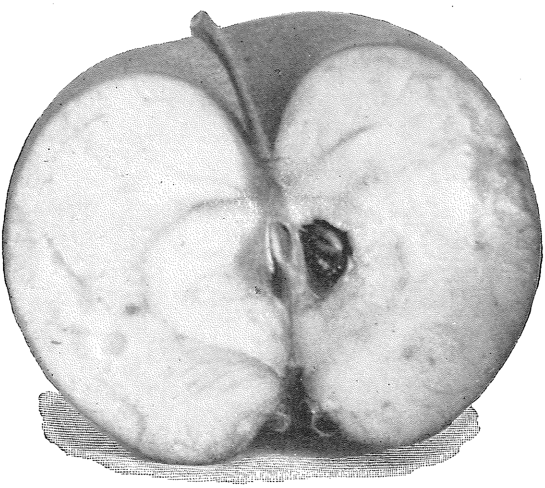
The tree is hardy, upright grower, spreading when in bearing, and an annual and good bearer. Fruit medium or below, roundish oblate, slightly conic, as you can see by the specimens. Color yellow, mostly covered with thin dull russet, with a blush of bright rich red in the sun, few brown dots. Stalk varying in length, as you see by the cuts. Cavity large, deep, acute. Basin medium, slightly corrugated. Flesh yellowish white, fine-grained, tender, juicy, rich, brisk subacid, slightly aromatic. Quality very good, or best, January to April.

There are two marked features which will aid in identifying this variety; not common to the russet family of apples. The bright red cheek, and the high quality as characterized by the tender and juicy pulp and rich sprightly flavor.

Since receiving the genuine samples of the Hunt Russet from Mr. Wood there has been no opportunity for a comparison with samples of unnamed russets grown in this State. It is altogether probable that this variety has become more or less disseminated among out fruit growers and that we shall find that at least some of the russets that have appeared from time to time at our annual exhibitions, and over which we have been puzzled, will prove this popular and valuable variety.



HUNT RUSSET. See page 83.



RED RUSSET.

A study of this variety of the russet family of apples may be found in the transactions of our society for 1887-8, page 89, prepared by the writer of this paper. (Which see.) It is not therefore necessary to give any detailed description of the variety in this connection. (See cut.) I have been growing the apple for several years and believe that much can be said in its praise. The tree is as good a grower as the Baldwin and bears as bountifully as that variety. The fruit is a deep red in color all over, dotted or splashed with russet, and sometimes with little or no russet appearing. In texture it is "solid as a rock," and will therefore bear the necessary handling in shipping without the slightest effect on its appearance. I believe this variety is worthy of attention among fruit growers.

FLETCHER RUSSET.

This is comparatively a late arrival. It originated in Acton, Mass., and is described in Downing's supplement, and was referred to in the letter from Mr. Wood before given. So far as I can learn this has never been introduced into this State, hence I pass it by with the mentioning.

The russets I have thus far enumerated are all of the named varieties of any special value that are grown to any extent in the State. This record might stop here were it not that the first step toward correcting the name of a fruit is to ascertain the fact that it is passing under an incorrect name.

There are several different kinds of russets grown in the State to a limited extent which appear from time to time, sometimes "name wanted" but more generally given the name of some of the familiar kinds.

KENNEBEC RUSSET.

Is a name found in the Transactions of the old Pomological Society. None of our fruit growers now know anything about it, and we never find the name at our exhibitions. I have no doubt that this apple is one of those stray varieties popping up at our exhibitions occasionally, usually labelled "Golden Russet" because it is tinted with yellow and nobody knows any other name for it. I have frequently noted a variety coming from the central part of the State of a beautiful yellow shade and covered all over with russet—a golden russet, in fact, though not true to the record. I have thought it probable that this is the apple referred to in those old records. Alas! who is there left to-day to set us aright!

WINN RUSSET.

Is another of those old waifs. This is mentioned by Cole on authority of Maine Pomological Report. Origin is given as Sweden, Maine. The name has passed from the knowledge of this generation of fruit growers. Downing also names it, probably taken from Cole. The name has never appeared in any collections shown at the exhibitions of this society, and is only mentioned here as showing that possibly some of the russets now found in the State may be the native apples named by those fruit growers who have preceded us and have passed away, leaving only a few stray sprays of the records of their work.

At the Sagadahoc Fair last fall I found two plates of "Golden Russet" of the same kind, one from Harpswell and the other from Bowdoin. A request for samples brought me a package from Mr. C. O. Purinton, Bowdoin, and with them the following letter:

BOWDOIN, October 26, 1896.

Z. A. GILBERT,

Dear Sir:—I send you by express one dozen samples of Golden Russet. I call them at their best in December and January.

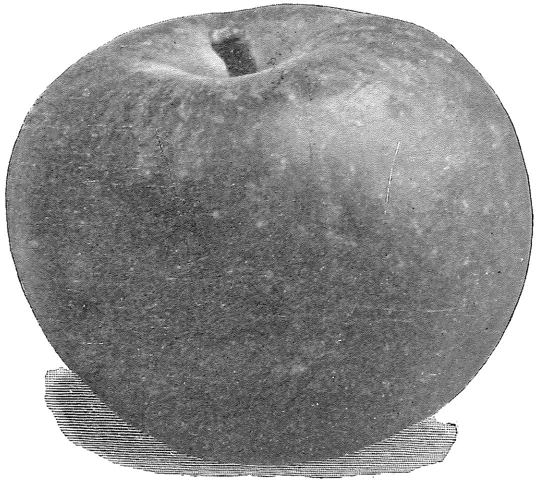
On my farm the tree seems to grow more slender limbs than the Roxbury Russet. They are good annual bearers—a little inclined to over bear which causes the fruit to be small.

Yours very truly,

C. O. PURINTON.

The apples received are truly a golden russet, but in no respect correspond with the Golden Russet of the authorities. They are a kind frequently shown at our exhibitions, and I have thought it probable might be the Kennebec Russet, if we but knew that variety. Certainly these are not the true Golden Russet.

The apple is medium size, slightly flattened, some specimens a trifle angular; calyx in shallow cavity, regular, stem long in



RED RUSSET. See page 85.

a very shallow basin; covered all over with a subdued golden russet; quality fairly good with subacid flavor.

From Mr. W. P. Atherton of Hallowell, I received two specimens labelled "Golden Russet of New York." As the two apples are as unlike as two russets can be, and I requested typical samples, a reasonable supposition is that on his trees no two of this kind grow alike. I have requested him to bring samples to this meeting, and after examination more can be said of them. It is plain enough, however, that neither of the two apples sent are true to the name given and that Mr. Atherton's nomenclature needs revising, or that he has put up a job on the writer.

Mr. D. J. Briggs, South Turner, shows at this meeting samples of a russet apple that I do not recall ever having met before. The apple was grafted by him for the Pomme Grise, and that is all that can be learned of it from the grower. The fruit is about the size of the English and the Golden Russet (of Western, New York) and of the form of the American Golden Russet, save that while the latter is regularly round in its perimiter outline, the apple in question is irregular, or sectionally ribbed in outline. Stem medium in length and set in a deep and broad cavity. Covered all over with thin russet, which is dotted all over with rough, projecting dots. Flesh firm, does not wither, crisp, juicy. Mild acid, and with a remarkably pronounced pear flavor and aroma. This last feature alone is enough to distinguish the variety. Flesh white, shading but slightly to yellow.

I have spent much time in search of a pointer to the identification of this variety but so far without making any progress. So choice a russet is worthy of attention. The description that comes nearest to the variety is that of the Windham Russet, a Massachusetts apple. But this makes no reference to a vinous flavor, and no pomologist describing the variety under consideration would omit this one of its most striking characteristics. I shall "keep an eye out" for this russet with a view to learning more of what it is and where it came from.

[NOTE. The writer procured samples of this variety of Mr. Briggs, and kept them, without special care, till June, sound, solid and crisp. At that time they were sacrificed to the knowledge here given, still sprightly in flavor, and of a quality best for their season.]

Sponge Russet is a variety sometimes met but of no special value. Size medium and above, slightly elongated, regular. Mild sub-acid. Never very juicy, inclined to wither.

Of sweet russets there are many kinds none of which have ever been classified, and I make no attempt to list them at this time.

POMME GRISE.

Is a russet by nature though not in name. This also is one of the varieties that have come to us from the New York nurseries. It is so distinct from other russets, and is so characteristically rich and delicious in flavor that there has been little if any confusion in regard to it. It is one of the few russetted apples that never appears at our shows labelled "Golden Russet." I mention it here only to make the list complete. Downing gives the following description:

"A small gray apple from Canada, probably of Swiss or French origin, and undoubtedly one of the finest dessert apples for a northern climate."

"Fruit below medium, (small grown in Maine,) oblate, roundish. Skin greenish gray or cinnamon russet, with a little red towards the sun. Calyx small set in a round basin. Flesh tender, rich and high flavored. Very good to best, December to February."

I have thus gone over the list of russets known and grown among us. I am aware that much I have given is only a record of what we don't know. But this should not be entirely without value, for in fruit nomenclature it is better to know what an apple is not than to give it an incorrect name.

There is still a numerous list of russets listed in the fruit books of which no mention has been made, and which so far as known have never been introduced among us. They are mostly if not all old varieties that have dropped out of date and probably out of knowledge, save as their names have been kept in the lists. With the exception of a few old English varieties, the most of them as given in the books are very similar in their characterictics—small in size and late keepers.

The russet apples of recognized market value, and which are now being grown and propagated to any considerable extent, are the three first named in this paper.

Roxbury Russet, English Russet, and Golden Russet (of Western New York). Of these the Roxbury Russet, on account of its size, is of most importance where it can be grown to advantage. The others are smaller than the popular demand of the market calls for and can only be recommended where the first named does not succeed. Indeed it may well be questioned whether they are found as profitable for the market as many other well known varieties which are not so late keepers. The market demand for late keeping apples is now comparatively limited. Hence the early summer price of the English Russet and Golden Russet is seldom more than the mid-winter varieties command.

But the varieties I have named and described are being grown to a considerable extent. So long as they are produced they should be correctly named. My purpose has been to so describe and figure the principal varieties of russets grown in the State and recommended by pomological authorities that they may be recognized by the growers, and the confusion of names so long met may thereby be made to disappear.

Of the non-standard russets grown my effort has been to show they are not the recognized varieties. Among them confusion must continue unless this society takes them up and gives them a name.

DISCUSSION.

Q. I would like to have Mr. Gilbert describe the American Golden Russet?

A. The tree is an upright grower and never a drooping one; the best way of identifying these trees is from this fact and the shape of the tree. You have an English Russet with stout branches sticking out high up and with the spurs prominent all up and down those branches and in bearing years stuck full of fruit. The apples are not on the ends of the branches but in looking at the tree you look through a crowd of apples. The American Russet has long pendant branches with the apples on the ends. The Hunt Russet is flattish in shape with a long stem and bright flushed cheek.

Q. Do I understand you to say that you have seen the American Golden Russet tree?

A. Yes, sir.

Q. It is evident there are two russets very much alike and eye is not keen enough, nor my experience long enough to tell them apart. The first of the season one has just the same value as the other; but later there is a russet we call the Golden Russet that commences to decay while there are others that keep very well. It is important for us fruit growers that have both varieties to know by the description of the tree. I am not able to learn just by the appearance of the fruit.

A. Mr. Merrill is probably confounding the Poughkeepsie Russet with the Golden Russet of Western New York.

SMALL FRUITS FOR HOME USE.

By L. F. Abbott, Lewiston.

A paper on a subject of considerable importance was presented Thursday afternoon by L. F. Abbott of the Lewiston Journal, it being the growing of small fruits for family use. The essayist departed somewhat from the usual course followed, and presented the ethical side of growing a supply of the delicious summer fruits for home consumption. The essay much abridged is given below:—

To talk of the small fruits for home use, is certainly not a new theme. The subject has been presented at almost every angle of observation, until it would seem there were none left to doubt the utility of the summer fruits for family use. Nevertheless, when the secretary of the Pomological Society invited me to present a few thoughts upon the subject, I accepted with the mental reservation that I would deviate slightly from the common course and exploit the theme from a somewhat broader horizon than is usually done, and endeavor at least, to show that there is an ethical side to the subject, that the moral economics of fruit growing for the home is of as much importance as any other.

It is expected, I presume, that I shall show the utility of the summer fruits for the family, and recommend certain varieties for cultivation for family use in the order of their excellence and season, treating the subject in a general way, leaving the special side of the question as to varieties of their kind, and methods of cultivation, to others that are to follow me.

This is an age of progress, and in horticulture, as in every other occupation, there are new ways of doing things, new ideas are coming to the front. Along every line there are new lessons to be learned, new applications of old principles.

Almost everything in this world has a theoretical side and a practical side. This is the case in growing fruit.

Theory is good in its place—that evolved from practice, for instance, and from everyday, common sense facts developed by actual contact with the plants in cultivating and caring for them.

THE POINT WHICH POINTS.

The point is this: Farmers are so accustomed to hearing or reading finely written essays painting in glowing colors the beauties and pleasures pertaining to the production of the summer fruits for home use, that it would almost seem that the very air about the farmer's home must be redolent with the fragrance and perfume of strawberries and raspberries in blossom and in ripened fruit.

Most of our farmers know that while this all sounds well on paper, there are practical preliminaries to be attended to, a measure of expert work of its kind to be done, to make possible the flowery glories of the fruit garden and indulgence in its luxuries. But notwithstanding the work necessary to accomplish this, it is not of a kind that prohibits such realization.

Everybody can have a garden and raise a few fruits; everybody who can get access to earth, air, water and the sunshine. There are no trusts to freeze out the householder from enjoying these God-given bounties, no letters patent to restrict their enjoyment to a chosen few. All classes, from the mechanic, to the farmer who cultivates his broad acres, may if they will, partake of the rich bounties Nature has so liberally provided for man through the exercise, on his part, of a little well-directed labor.

According to an account I saw in an agricultural paper lately, anybody with a space of earth at command on which to set a barrel may enjoy the luxury of several bushels of strawberries grown in a very novel way, simply around a barrel. Linseed oil barrels are preferred on account of their durability. Inch holes are bored in alternating rows eight inches apart, giving space for 135 plants. Some soil is placed in the barrel, strawberry plants are inserted in the first row of holes, then more soil filled in, and so on, till the barrel is full. The plants are easily kept watered and fed by turning water and liquid manure into the barrel.

The advantages of the barrel method of growing strawberries are that no runners grow, and the whole strength of the plant is directed toward growing fruit. The berries are perfectly clean, all cultivation and weeding are dispensed with, and there is great economy of space. Five bushels are the maximum yield of berries, and three or four the average, depending on the variety and management of one of these barrel gardens.

MORAL ECONOMICS.

Now this subject of the Home Garden involves quite a range of instructive thought, if we turn away from the purely material side of the question and discuss it from its ethical and moral bearings as it relates to home and home influences on the farm. Life it is said, is what we make it. The influences emanating from the Homes of our country exert a greater power over the lives of its citizens, for weal or for woe, than all other influences combined. The ideal home justly included in the sacred trinity of "Mother, Home and Heaven," stands in our New England communities at least, as a mighty bulwark against the floods of evil and demoralizing tendencies incident to our time.

TOWN AND COUNTY.

Effects are results of causes. For the past decade there has been a rapid increase in the population of our cities, and largely by the influx of young men from the rural country. There is a cause for this. What is it? Without attempting to answer this question in detail, I am compelled to say that one reason is lack of congenial home surroundings, coupled with the fact that farmers themselves encourage their sons and daughters to think that there are more honorable, pleasant and easier ways of gaining a livelihood than that of farming. And it is too often the case that this class of farmers set no example of dignifying their calling, or of learning themselves, or teaching their sons the principles invested in the cultivation of the soil, and it is by no means surprising to find young men disgusted with the avocation which promises nothing else but unremitting care and a dull routine of continued and severe labor.

I saw a statement recently that surprised me somewhat. It was this: The writer says: "I have made careful inquiry, and make the statement on reliable authority, that the greatest proportion of criminal and vicious young men under 25 years of age, convicted of crimes committed in the city, are those reared on the farm until they were 15 to 18 years of age."

Now this, if true, is an alarming condition of things. It calls for earnest efforts on the part of the fathers and mothers, the home-makers of our rural country, to make the home life for the sons and daughters happy, and farm life and work pleasant rather than irksome and drudgery. The young have a firm belief that life ought to yield a great deal of pleasure, and if things are unpleasant at home they will go elsewhere in hope of bettering their condition.

Other things being in keeping in the home affairs, a bountiful supply of the summer fruits grown by the family and for the family, counts as a moral force in the home; the culture of the higher nature of its inmates whose recompense is in coin that will be current in the higher spheres.

CURTAILS DOCTORS' FEES.

There is health in the growing of the small fruits for family use. A direct beneficial effect from the consumption of the fruits themselves, and also in the work of cultivating them. Horticulture is peculiarly adapted to the capacity of women in the requirements of manual labor. In man's primeval state the woman seems to have gathered the first fruit—whether she had a hand in cultivating it is not so clear.

The small fruits are healthful of themselves as a dietary factor in the farmer's family. As appetizing promoters of health, as important factors in economizing household expenses, such as the reduction of butchers' and doctors' bills, an abundant daily use of these small fruits in the farmer's family more than compensates for all their cost and trouble.

The late E. P. Roe said: "I have known invalids to improve from the first day that berries were brought to the table, and thousands would exchange their sallow complexions, sick headaches and general interest with life and its abounding pleasures if they would only take nature's palpable hint and enjoy the seasonable food she provides. Belles can find better cosmetics in the fruit garden than on their toilet tables, and she who paints her cheeks with the pure, healthful blood that is made from nature's choicest gifts and the exercise of gathering them, can give her lover a kiss that will make him wish for another."

STRAWBERRIES FIRST IN THE SEASON.

Beginning with June we have the beautiful, delicious and ever-welcome strawberry, and these are supplemented in succession with raspberries, black and red, currants, gooseberries and blackberries, a good list of delicious, healthful luxuries, and all within easy reach of every farmer in the land, in the very height of perfection at the very lowest cost.

We class the strawberry as easily at the head of small fruits for family use. Its ease of cultivation, quickness to mature a crop after setting the plants, its beauty and the wide appreciation in which it is held by all as a table fruit, render it the universal fruit for the home. We can readily imagine that among the bounties of the Edenic existence the strawberry was among the first choice fruits, and the choicest of the first fruits given to man.

OTHER FRUITS THAT FOLLOW.

Next in value and general estimation comes the raspberry and then the blackberry. Neither are so well suited to the small garden as the strawberry, but may well be included in the farmer's garden along with the currant, and if your disposition will bear it, the gooseberry. The gooseberry is well enough in its place—floating in sugar—but it isn't a berry the majority of people hanker after—we'll except the gooseberry worms, they do. Its cultivation is not so pleasant on account of its thorns, yet many admire the peculiar acid of the gooseberry, especially its flavor in jelly for tarts, etc.

The currant fills a niche peculiar to itself. Grown to perfection as it may be by any one, but only by good cultivation, it comes in as a handy berry after strawberries to be served when ripe either raw or cooked, or earlier when quite green for sauce or pies, and then the main crop later canned for winter use. So good a fruit and one so easily cultivated, and one that responds so readily to a little extra cultivation, should not be omitted from the home garden.

There is one point applicable to all three of the bush fruits, the currant, raspberry and blackberry, that may be urged in their favor, and that is the comparatively little care they require after the plants are set. Properly trimmed and the superfluous sprouts and new growths restricted through the summer, a plantation of either sort will thrive and bear for an indefinite time.

LESSONS FOR THE BOYS AND GIRLS.

The cultivation of the small fruits, even to the limitation of the home supply, affords a fine field for the boys and girls to cultivate and develop habits of study and observation, especially in growing seedlings and starting cuttings. Take the currant and gooseberry, for instance. In growing new plants from cuttings, the wonderful processes of nature are brought to view, and becoming interested in these things the mind is expanded and the affections broadened and deepened by the beneficent influences emanating from touch with the harmonies of Nature.

The interest once fairly started in watching and waiting the growth and development of plants which their own labor and care have developed, and the pleasure they experience in testing fruits of their own production, or in showing them to others, ought to inspire a fascination and attachment to the farmer boy's home that would lessen the desire and inclination for city life, and if they should eventually leave home to seek their fortune in town or city, they will in after life retain pleasant memories of their childhood home with becoming gratitude to father and mother.

BEST METHOD OF GROWING THE STRAWBERRY AND THE RASPBERRY.

By CHARLES S. POPE, Manchester.

Perhaps I had better tell you some of my failures and so warn you off the rocks. To make a long story short I will just say that why so many fail is because they do not understand the first principles of raising the strawberry and raspberry. They are induced by some agent to take a few strawberry plants with big pictures and big names. The plants are all dried up when they receive them and in nine cases out of ten they are nearly all lost at the beginning. The first two beds I set I didn't get strawberries enough to pay for setting out; I kept it up and find it one of our easiest fruits grown. First be sure that your plants are fresh, see that your ground is well prepared and enriched. Dig holes with a trowel, spread out the roots and plant them at once. Fertilize them plentifully and keep them hoed; no matter if there are no weeds there, go out and hoe that bed. I was speaking on that subject to Mr. Phillips and Mr. Webber got up and said, "my bed didn't look half so well as my little boy's just along side of it." He was interested in strawberries more than I was; whether they needed it or not he was out hoeing those strawberries. He watered them with a hoe. Fine mulching and fine dirt on the surface keep the ground moist; the secret of raising strawberries is to keep the ground rich and thoroughly stirred.

RASPBERRIES.

The great failure has been that most people put the plants too near together, allowing for lots of suckers to grow but no raspberries. Who would think of growing corn close together and getting any ears of corn; if you want fodder the thicker the better. Be sure and cut out all except a few canes right in the hill. Don't get them too near together or too deep, raspberries grow very near the surface. Keep the weeds down and the dirt loose. The varieties which are tender should be protected by simply laying over the top and then a shovelful of earth thrown against the plant and a little over them. Even last year when the snow was only on a few weeks those that were laid down were all right and those allowed to stand up were dead to the ground.

DISCUSSION.

Q. What variety of strawberry do you prefer?

A. Depends on the soil. The Crescent and the Bubach are good.

Q. What do you fertilize with?

A. Wood ashes.

Q. Barn manure would contain too much nitrogen, would it not?

A. Not for the Crescent.

Q. How do you set out the plants?

A. Set out in rows about three feet apart and nine inches in the row and you have a solid mat of plants with a few small berries. I set mine three feet apart and two feet in the row. If they are getting too thick I thin them out.

Q. Do you use the horse?

A. I do. Some put them seven feet apart and three or four feet in the row.

Mr. CHURCHILL—I started out to-day to visit a friend of mine here and I got behind the times about a week in regard to this meeting. The first thing my friend said was I supposed you would be coming up to the meeting and we were looking for you. So you see how careless I am. I remember the first time I started out to raise strawberries I set out some less than ten acres and like the woman who planted the seeds and kept digging them up to see if they were growing I would dig down and lo and behold instead of growing up they were growing down and I began to investigate and found they had no roots at all. I got my ground ready and set out some more and I was surprised to find how many berries I got off of them. The main thing to start with is good plants. Of course there is a limit to the number to be set in a hill; if we set too many plants we get too many roots in one place and they crowd themselves. So it is a question just what to do; some will grow and make more plants than others, so we have to use different management with strawberries the same as with everything else. I set mine in sections three feet and a half apart with an alley-way of a foot and a half and each plant six inches apart, so we can run through and cut the runners off.

As to raspberries, I noticed what the brother said and I think we make a mistake in putting our raspberries too thick. I have mine five feet apart each way and have hills so that I can walk in between. The more I thin out, the more berries I get. It pays to lay down the bushes they will bear more berries the next spring; I lay down all my plants, but you will have to stoop over some.

Mr. TRUE—How do you trim in the spring?

A. About a quarter to a third. I used to trim in the fall but now I lay them down and trim in the spring.

Q. Do you pinch back?

A. No, sir, I do not.

Mr. ATHERTON—In strawberries you prefer the hill culture?

A. As a whole I do.

Q. What about blackberries?

A. They are a good berry but I never could do much with them.

Q. They are a good berry to market are they not?

A. Yes. Of course the size has a great deal to do with that.

Q. Do you give the blackberry about the same culture as the raspberry?

A. Yes, sir.

Q. Did I understand you to say that you planted raspberries in the fall?

A. Yes, sir. I planted about half an acre this fall.

Mr. TRUE—I would like to inquire about the Quoddy Belle strawberry?

A. Where they were raising them down in Washington county, they claim it was doing well. They were getting twenty cents a box in Boston for them. [See Secretary's Portfolio for description of the Quoddy Belle.]

JELLY MAKING.

By ALANSON S. GRANT, Lewiston.

It is not without some misgivings that I shall attempt to speak to you this evening upon what is to me a most interesting and important subject, and I think I may add that it is a most interesting and attractive subject to any one who may have become closely acquainted with it. Our State has always been noted for the variety, the high standard and the great commercial value of its apple product. It has also, always been a source of great pride to our citizens, but while it has been a source of financial benefit to a great extent, it seems to me that one phase of its commercial value has wholly or to a great extent been overlooked and ignored.

Very few people are aware of the great value of apples for the purposes of jelly making; and strange to say this is more especially true of those who are themselves large growers of apples. It has always been the custom to prepare during the summer and fall a supply of canned fruits, preserves and jellies to have during the winter as delicacies, when we are deprived of the luxuries which we are accustomed to during the summer. The jellies which we are accustomed to see on our tables are those made from the different berries which we raise and from the fruits of other states, but the apple is more conspicuous by its absence.

The greatest factor that has brought out the jelly making qualities of our apples is our Maine State Pomological Society, which has so generously offered, from year to year, liberal premiums for the best display of apple jellies made from distinct and named varieties of apples. It has aroused an interest throughout the whole State in the subject and excited inquiries which have reached great practical value, so much so, in fact, that at our last meeting at the State Fair in September, the exhibition of apple jellies was so extensive and of such a high standard, that it was a source of pride to the officers of the society, and of great interest to the visitors at the exhibition building. Among the great number and variety of apples of the State there are very few, if any, that are not suitable for jelly, the possible exception being the sweet apples, but I may say that I have been successful in obtaining a very good jelly from certain sweet apples, Talman Sweets and Sweet Baldwins, but as a rule they are not adapted to jelly making. The great variety in color and flavor that may be produced is really remarkable, the colors ranging from the almost white jelly of the Yellow Transparent to the deep crimson of the Red Astrachan, and the flavor from the very delicate Porter to the sharp acid of the Quince Apple.

To state a definite rule, by which to make apple jellies would be a very difficult and perhaps impossible task but I am going to give you a rule, which may be applied successfully to a majority of the apples. It does not require first quality of apples, second grade fruit being just as good, but it is very necessary that the apple has attained its growth, should be of good color and as near ripe as possible.

The rule which I am about to give is, of course, open to and subject to those little additions and corrections which from time to time suggest themselves, these additions are, of course, more readily noticed by a person who has become closely acquainted with the different apples and who has acquired a knowledge of their characteristics, but as a rule the natural instinct of the housewife, in such matters, readily grasps the different requirements of the various apples.

THE RULE.

First quarter your apples, using the whole apple, as the peel is in a great measure responsible for the color of your jelly and place the apples in a large porcelain kettle, using to every four quarts of apples, two quarts of water for fall apples and three quarts of water to four quarts of apples for winter fruit; place the kettle upon the stove and allow the apples to cook until they become just soft but be careful that they do not cook until they become mealy. Now pour them off into a large flannel and allow the juice to drip through into a dish, it may be well to squeeze the pulp a very little to get the full richness of the apple, but be careful you do not get any of the pulp into the juice as it spoils the clearness of your jelly.

Now place the juice in a porcelain kettle, having it spread over as large a surface as possible, as it boils down much quicker, and allow it to boil rapidly for ten minutes, all the time skimming off whatever scum arises to the top. While the juice is boiling the first time you should have your sugar in the oven heating allowing a pound of sugar to a quart of juice. After the juice has boiled for the first ten minutes stir in your sugar rapidly, allow the sugar to all dissolve and then strain the juice the second time to get out whatever specks there may have been in the sugar. Allow the juice to boil the second time until it will just drop in heavy drops from a spoon, this will require, on the average about twelve minutes. Now the jelly is ready to pour off into your tumblers. Allow it to cool until thoroughly hard, and place a piece of wax paper over the top and be sure the covers to your tumblers fit tightly and then place the jelly in a cool dry place.

In the making of these jellies one must necessarily depend a great deal upon their own judgment, for some apples will jelly much quicker than others, some will perhaps require a little more water for boiling and others will need more sugar, and I will say that it makes a great difference in the time of year that the apple is used, the nearer to the time when the apple is taken from the tree the better. As a rule you will find that the winter apples do not make near as clear a jelly as the fall apples, neither is the flavor of the winter apples as delicate as that of the fall apple. The winter apple though makes a heavier jelly and a more durable jelly than the fall apples for while the jelly which we made last fall is beginning to soften the jelly made from the winter apples will last through the hottest part of next summer. The lack of clearness in the jelly made from winter apples is attributable to the fact that the winter apple is a harder, firmer apple than the fall apple, and requires much more time to boil the first time. I attribute the more delicate flavor of the jelly made from fall apples to the fact that the apple is taken from the tree and made into jelly, and the apple has not lost any of its richness, which the winter apple must necessarily lose by being picked before they are ripe and then kept in the cellar for a long while before they are used.

The rule which I have given you, if followed, will, I am sure, give most satisfactory results.

For the benefit of some I think perhaps it may be well to name a few of the choicest apples for jelly. The apples which I shall name, are to my mind, the very best for this purpose, and I will say that they are picked from a list of over one hundred different varieties which my mother and myself have experimented with. Of the fall apples the following are the best, and I will give them in the order that I consider them, the Porter, the Astrachan, Duchess of Oldenburg, Killhamhill, Yellow Transparent and the Alexander. Of the winter apples the Bellflower, the Greening, the Baldwin, the Ben Davis and Tompkins King are the best. I shall place the Porter and the Bellflower at the very top of the list, the Porter being replaced in the winter by the Bellflower, and that much abused apple the Ben Davis is one of the very best apples we find for jelly. I didn't know but someone might be glad to know that it was suitable for some purpose.

I feel that I have gone pretty well over the ground of apple jellies so far as I know and now I wish to make mention of another use to which apples may be put in making jellies other than pure apple jelly. I have found in dealing with apples that there is an apple which corresponds with the nature of all of our different fruits, that is, that by using apples for a base and combining with it the juice of the different fruits a jelly may be obtained which far surpasses the clear fruit jelly. For example to make a fine strawberry jelly, take the strawberry apple, for a lemon or orange jelly use the Bellflower apple, for a currant jelly or a raspberry jelly use the Baldwin apple and so on through the whole list of fruits. In this combination you avoid two results which make the pure fruit jellies objectionable. You avoid the expense sometimes incurred in making jelly wholly from the berries and expensive fruits and then again that objection which is often raised against these jellies, namely their insipid flavor, is entirely done away with. The apple gives to the jelly that splendid tart flavor of the pure apple jelly, it gives it a firmness, it does not injure the color but rather adds to it and it reduces the expense of the jelly to such a degree that we can be able to make the fruit and berry jellies with as great freedom as we are accustomed to the apple. It is possible to make a jelly this way that is far beyond the pure fruit jelly, this is especially true of strawberries and raspberries.

FRUIT AS FOOD.

By Anna Barrows, Boston.

Miss Barrows began by saying that she had appeared before so many meetings of the Pomological Society that while she had little new to say constant repetition may serve in increasing the use of fruit as food. People are apt to look upon fruits as luxuries rather than necessities. They forget that the date and the cocoanut and the banana supply the main food of people in tropical countries. Even in our colder climate we should do well to depend upon fruits more than we do.

Fruit is valuable because it furnishes us with water in a very palatable form. Physicians tell us that one of our greatest dietetic errors is a failure to use sufficient water or watery foods. Because fruits are mainly water their actual food value is underestimated. The sugar that comes to us through fruits is worthy of consideration. Too often we lose the best flavor of a fruit by burying it in cane sugar.

The acid juices of fruits are especially desirable to counteract the effect of foods which are gross and heavy. Thus we serve apple sauce with roast goose and roast pork. We might prepare apples with fats more than we have been accustomed to do in the past, apple salads have been popular of late. The apples are pared and cored and served with a French dressing, that is oil and vinegar with a little salt and pepper or with a mayonnaise dressing. Again the apples are combined with celery or onion or nuts and served with either a cooked or a mayonnaise dressing.

The fried apples which were a standard dish with our grandmothers might often take the place of potatoes with sausages or chops to good advantage.

We have yet to learn about combining different varieties of fruits just as tea merchants give us different blends of tea. By putting two kinds together we may get something far superior to either. It is an indication of progress that we are learning to make such beautiful jellies as are displayed here, with their wide range of color and flavor. By and by instead of allowing so much fruit to spoil, in the seasons when apples are most abundant, the juice will be expressed and put in some of these concentrated forms to keep until fresh fruit is less abundant. Such apple syrups or jellies can be used by themselves or in combination with other substances in the preparation of many puddings and ices. Apple pie is good in its place but we need a greater variety of simple desserts.

DUTCH APPLE CAKE.

Sift together one pint of flour, two teaspoonfuls of baking powder, one-half teaspoonful of salt. Rub in one ounce of butter and mix soft with one beaten egg and one cupful of milk. Spread in a shallow buttered pan, cover with rows of apples cut in eighths putting the sharp edge down. Sprinkle with one-fourth cupful of sugar in which a little cinnamon is mixed. Bake about one-half hour.

Sauce—Mix one cupful sugar and one heaping tablespoonful of flour, pour on one pint of boiling water and cook for five minutes, add one ounce of butter, one or two tablespoonfuls of vinegar or lemon juice and a little grated nutmeg or rind of lemon.

APPLE OMELET.

Beat three eggs thoroughly together, add one-half cupful unsweetened apple pulp, season with salt and pepper. Melt a tablespoonful of butter in the omelet pan, when hot pour in the mixture shaking gently to keep it from sticking to the pan. When the eggs have stiffened roll or fold and serve immediately. Or the omelet may be made without the apple and after cooking spread the sauce over the surface before folding the omelet.

COMPOTE OF APPLES.

Make a syrup with one cupful of each sugar and water, Flavor with a bit of lemon peel or cinnamon bark if the apples require it. Core and pare medium sized apples, without cutting up, and cook them whole in the syrup,turning over occasionally. When soft, drain, and fill the centres with a bright jelly, crab-apple of currant.

APPLE SALADS.

Arranged by Mrs. Lincoln for the American Kitchen Magazine.

Whip one cup of thick well-chilled cream, with an egg beater or fork until thick, then add gradually sufficient lemon juice to thin it slightly, and season with half a teaspoonful of celery salt and a spoonful of paprika. Use a thin-skinned tart apple. Wipe, quarter and core without paring, divide again lengthwise into two or three pieces, then slice very thin. For two cups of the apple use one cup of fine cut celery. Moisten with the cream dressing. Season to taste with salt and pepper. Arrange in a shallow glass dish and garnish with green celery tips and crescents of the red apples.

CHESTNUT, APPLE AND CELERY SALAD—Prepare the apple and celery as directed in the first recipe. Shell, parboil and skin the large French chestnuts. Boil twelve minutes, or until soft but not broken. Drain and when cool cut them into thin slices. Use one cup of each measured after slicing. Season highly with a French dressing, and keep in a cold place. Serve in a salad bowl surrounded with crisp lettuce.

APPLE AND ONION SALAD—Boil one cup of vinegar. If strong use half water. Mix one teaspoonful mustard, one teaspoonful cornstarch, one-half teaspoonful salt, and one-half saltspoonful pepper with one well beaten egg. Stir this into the boiling vinegar and cook until creamy. Pour it over two mildly acid apples and one onion chopped fine. Serve it with lettuce cups.

APPLE SALAD—Place in a saucepan on the range one tablespoonful of butter and one and one-half tablespoonfuls of flour (well mixed), and when hot pour over it, stirring constantly, one cup of sweet cream. Let boil for five minutes stirring all the time. Remove from the fire and stir in one-half cup sour cream, the juice of half a lemon, a *very* little salt, and sugar to taste. Allow to become perfectly cold. Pare and slice, after coring and cutting into quarters, some mellow pippin apples. Pour the mixture over them and set on ice one hour before serving. This will please those who find they cannot eat oil.

PRINCIPLES INVOLVED IN MARKETING.

By Phineas Whittier, Farmington Falls.

In times of peril and great disaster it requires a cool head and a steady hand to do what is best to be done, and if this ever applied to the apple business it does at the present time. It is no use to get discouraged. All products we raise have their ups and downs, times of profit and times when no profit comes, and if we can manage in seasons like the present to make no loss we are doing well. I have repeatedly said that it requires greater skill and ability to care for and dispose of a crop of apples at a profit than it does to grow them and the longer I live I am more and more convinced of its truth. In times of scarcity and buyers plenty any orchardist can make a good profit on his fruit with hardly any trouble, but in seasons like the present this cannot be done. Any orchardist should be fitted up so as to put his fruit in the best possible shape for the market and know just what to do in case of a glut or high winds or any other disaster to his fruit. My motto is to put no part of the apple crop on the market only as a strictly fancy No. 1 article. You will all agree with me, that fruit should be put up in an attractive form to sell, but some good honest men think that means to put up the whole crop, good, bad and indifferent so as to be attractive by putting the good at the ends of a barrel and the poor in the middle, but then the attraction does not last long enough when it is opened. What I mean by putting all on the market as fancy is to can or evaporate all the bruised or wormy and smaller ones and take such pains with them as will make a fancy article and this can be done and with proper storage can be held for a year or two in good shape for use. In this way we can prolong the period of consumption and rid the market of poor fruit which serves to injure the sale of good fruit. When apples are as cheap as they have been this year, if any one is going to buy for that purpose he had better buy No. 1's than to take the gift of No. 2's, it is so much less work to fit them in good shape and they will make more to the bushel.

In preparing apples for market the first thing to be attended to is the proper care of harvesting. If they are roughly handled then they can never afterwards be made to look as they should and they will not keep so well. Then, if they are to be held any length of time, the storing of them is of the greatest importance. They should be stored where the temperature does not quickly change with the outside temperature and in cool weather, until freezing weather comes, the place should be kept open and in warm weather closed and when it becomes very cold the reverse. The object being to keep as even and low a temperature as possible without freezing. They must be stored in a dry condition or they will soon decay. Good ventilation is absolutely necessary in any place that is secure from frost. I have seen apples stored in barns and out buildings where they would get very dusty and the frequent changes of the weather would cause them to become wet and the dust would adhere to them so that it was almost impossible to make them look bright and nice and the moisture and dust is most favorable for the growth of fungi on them. When apples are put in in a dry condition I have found them to keep better in large bodies in open bins or boxes than in tight barrels, except russets which should be kept from the air as much as possible to prevent shriveling.

Apples should be put into the storeroom where they are to remain as soon as they are harvested and should be put in when they are warmer than the temperature in the place of storage. If apples are left in outbuildings until cold weather it is almost impossible to store them so as not to have them become wet and they will remain wet so long that they will mold and decay. I dwell somewhat upon the proper storing of apples for it is one of, if not the most important and difficult matters to be attended to in order to have nice clean fruit free from fungi.

As to the best time to market it is no easy matter to decide. Those who are best posted and observant are very liable to be mistaken. Very much must depend on one's facilities for storing and the condition of the fruit at harvest time. It is of no use to store apples for keeping that show any signs of becoming scabby, for that will grow on them after being stored.

If anyone has used up all his inferior and defective fruit by canning or evaporating and kept the remainder so that it is bright, hard and sound he can get a fair price for it even if the market is glutted in late winter and spring; providing that it is known to be honestly packed. If any one has not the proper facilities for storing and wishes to sell all in a green state, he had better, generally, sell as soon as possible after harvesting. We as orchardists cannot too strongly condemn the practice of putting good fruit in the ends of the barrel and poorer in the middle. It is a disgrace to the business and injures all of us and the only safety for honest packers is to have their own names on each and every package they put up. I think buyers and packers are doing a greater injury to the business than are the fruit growers themselves. The first time any one sends a really fancy, honestly packed lot of fruit to market the buyer says, Oh, I guess it is packed as usual and I cannot pay any extra for it, but when he finds it to be nice and he wants to buy again, he will inquire for the same brand and as soon as he finds that it can be relied on he will pay an extra price. In selling apples and working for a good reputation in the business it is much the best way to find the right commission merchant and stick to him and let him have all your fruit to sell. One of the most important principles for an extensive, and, I might say all fruit growers, is to look ahead and be prepared for all the mishaps that may befall his business. Some years, the present especially, No. 2 fruit is not worth anything. Some times high winds will sweep the fruit completely from the trees and many other conditions may happen that render the fruit unfit for market. At such times there is only one chance to make a profit on the fruit and I prefer to take that one chance and that chance is to prepare it for market by canning or evaporating.

If we neglect to fit up until such things come upon us it is generally too late to take advantage of them. Very much the best way is to look ahead as though we were expecting such to happen and be all ready and prepared to take care of and use up all such fruit at any time. I find it quite an alleviation to my grief at such times to be so prepared. In making preparation for taking care of the fruit crop don't forget to store up a sum of cash to draw on at such a time for it costs something to properly take care of a fruit crop, but it will pay if anything will. I should not hestitate to hire money to do so as I have had to sometimes. I have put about fifty cents into each barrel of my No. 2 apples since harvesting, in evaporating them this year. It requires some courage but I believe it will pay me something, especially if there should be a short crop next year. In some like instances I have realized more money from my No. 2's than from the No. 1's.

It may be asked if every one used up all their poorer apples in the way I speak of, if the market would not be over crowded with such products? Well, if it should be, it would be no worse than it is to over supply it with the green fruit and it would relieve it of so much poor fruit. Seldom or never would the price of canned or evaporated fruit go so low as not to leave something to the credit of the apples, at least this has been my experienceand if it isstored and held overanotheryear and there should happen to be a light crop, then there would be a good profit and sometimes a great one. I am convinced and have been for years, that if I did not use up my poorer fruit as I do I should loose more than one-half of the profit from my orchard.

DISCUSSION.

Q. I would like to inquire how long it is since Mr. Whittier came to the conclusion that apples do not sweat?

A. As long ago as I wrote for the "Home Farm" I advanced the idea that apples do not sweat. Dr. Hoskins said it was just what he had known for a long time but he "Didn't dare to take so big a bull by the horns." It is caused by the apples being colder than the atmosphere around them. You carry a stone from outdoors and you can hardly get it down cellar before it will be wet. So it is with apples if they are stored where the temperature is constantly changing. Perhaps there will be a warm spell, perhaps a foggy spell; and a foggy spell is worse than a warm spell. Then if you let your apples stay out until they are almost frozen, when they are put in the cellar they will sweat as you call it, and it will be a long time before they dry off.

Q. When is the best time to pick winter apples?

A. I commence on those that need picking first. You can readily tell by the color of the apple and the ease with which they pick. I commence with the Rhode Island Greenings; if I let them be on the trees as long as the Baldwins they will mostly be on the ground. The Northern Spy I leave until the last thing. One year I left them on until the frost had taken the leaves all off the trees. Not a leaf on the tree but the tree filled with the prettiest apples you ever saw.

Q. How did those that you left on so long keep?

A. The best of any I ever had. I kept them until along in April and they were just as bright as could be.

Q. Had it been cold enough to freeze those Northern Spies on your trees?

A. No, sir.

Q. Do you think it hurts an apple to freeze solid?

A. Yes. An apple may freeze so you will think it is ruined but if they are let alone the frost won't hurt them.

Q. You spoke, Mr. Whittier, regarding the disposition of your No. 2 apples which you can or evaporate. We small growers cannot go to the expense of doing that.

Mr. WHITTIER—It costs a good deal to fit up to evaporate in good shape; but to can it costs but very little. If a person has fifty or a hundred barrels he could do it at very little cost. In fitting up to can you can fit up on a small scale very easily. I have known some in our neighborhood to have a common barrel boiler set and get a cover for that and something to raise and lower the apples into it and use that for cooking their apples.

Mr. FAIRBANKS—Did they put them up in tin cans?

A. Yes, in gallon cans. The expense is very small aside from the cans.

Q. How many pounds will they make to the barrel?

A. Pretty good russets will make twenty pounds to the barrel. Of course a good many apples would go in that you wouldn't think of putting in as second quality and they would make about sixteen pounds to the barrel; Baldwins will dry out more than Greenings and Greenings more than some soft fall fruit.

Q. What proportion of your fruit do you evaporate and can?

A. About one-half this year and I had nice apples too. Some years I evaporate and can two-thirds of them.

Q. You evaporate all your apples except those that are strictly fancy?

A. In a scarce year I would make three qualities of them and make a good second quality and send them to market as No. 2.

Mr. WHEELER—Speaking of the large number of small growers; from your experience of the past what would be your advice to them in regard to canning or evaporating? You purchased and at the present time are using a large steel evaporator; that perhaps was necessary in your business, but would you advise the smaller growers to fit up with steam as you have?

A. I should advise them to fit up and can the fruit instead of evaporating it as they could run it economically on a smaller scale.

Q. Do canned apples find as ready a market as evaporated ones?

A. When they are put up in cans the people can't see them and so they buy them.

HOME MARKET.

By W. H. KEITH, Winthrop.

Home market I suppose means American market—a market where we can dispose of our surplus products. To obtain the best returns from any market the first requisite should be quality. Quality of the product, quality of the person producing and quality of the person handling the product in the market.

This may seem random talk, but I believe there is more satisfaction and more profit in producing a good article and placing it in an attractive form in the distributing houses of dealers who place their goods at their customers' door, guaranteeing value received.

Within the memory of many of the older persons in this assembly, the marketing of the surplus apples of the farm was done in a meal bag and to break the monotony of the color of the apple a dusting of meal appeared on the fruit when emptied. Small fruits of various kinds growing spontaneously in the fields and around hedges were marketed in pails and baskets. Even the potato formerly was loaded into the ox cart in forty and fifty bushel loads and emptied into a spout and tumbled into the cellar. But time changes everything, such ways of marketing and handling products of the farm have gone by and new methods have been adopted.

The home market as well as the foreign market is sensitive nowadays—quality and uniformity demanded. Insisting upon quality first next should come grade. Grade all products so that unifomrity may be found from top to bottom and from center to circumference. When this is done and the goods once introduced in the market with your guarantee behind it your market is secured. Every producer of farm and garden products who adopts and strictly adheres to the above requirements with full weight and measure will almost invariably find a home market.

I believe we are as yet in our A B C's regarding our imperative duties in producing, preparing for market and marketing our farm products. Offer no product that you demand the top market price for, unless the grade and assortment is first class to the letter.

There is, however, a class of trade, although limited, that will prefer a lower grade at lower prices and trade of that class can more easily be supplied with unsatisfactory results.

The ruling tendency to supply the markets with food products is slipshod, mixed, uneven, uninviting, profitless.

Consumers as a rule are exacting in their tastes and demands for first class products. Give them such products and satisfactory prices can be obtained.

When the producer and consumer can be brought nearer to each other for the necessaries of life and cooperate in trade in a more general way,then the home market will be appreciated and become one of the most inviting and profitable channels through which to do business.

In seeking a market for our farm products, we are too apt to overlook our nearby market. Aim to produce such products as the surrounding market calls for, anticipate the demand. Every month of the year some product of the farm is sought for by the consuming community and if those products are at hand purchasers may be found to take them.

Cater for the home demand.

SHIPPING FRUIT TO FOREIGN MARKETS.

By W. P. Atherton, Hallowell.

In 1892, I shipped two car-lots of apples to a reliable firm in Liverpool and they netted me $235.00 better than if sold to buyers on this side; that was because they happened to arrive there during two of the best weeks of the season. The next year I shipped one car-lot and waited returns before sending another, and it was well I did, for I lost $175.00 on that one venture. I sold afterwards to a Boston firm what I had left of that season's crop. The next year I shipped two or three car-lots of Baldwins and one car-lot of Spies. The former netted me $1.40 per barrel and the latter $1.70 per barrel, and all I was offered on this side was $1.25 per barrel for both varieties.

Last year, 1895, my crop was so small and fruit rather inferior, I sold to buyers in this State in preference to shipping. This year I had more than I could put into my cellar and concluded to test the markets before shipping largely, so I sent forty barrels of choice early winter fruit and thirteen cases of choice fall fruit wrapped as you would oranges. They were Gravensteins—first-class in every respect—apples that would have brought me $2.50 to $3.00 per barrel in Boston, and they netted me back just $2.19, within three cents of enough to pay for the cases; the forty barrels of choice early winter fruit—consisting of Kings, Hubbardstons, Mother, Nodheads, &c.,—netted me $12.05, enough to pay for the barrels and the packing—a most deplorable result, so Mr. Geo. A. Cochrane said. I therefore concluded that experience was sufficient for one season, and sold the bulk of my crop to Boston parties at what were considered fairly good prices. There was no fault found with the fruit, either in the cases or barrels, that was first-class in every respect and sold quite well, but at that time freights were very high and the markets thoroughly demoralized by extremely heavy shipments. Much of the shipments, too, was of a character to depress rather than help a market; it consisted of soft and inferior fruit, for people imagined that because England was short on her apple crop she would buy anything and everything and pay big prices, but they got woefully mistaken. On account of the immense crop of apples there seemed to be a perfect craze to get rid of them somehow. Everybody, including commission merchants and buyers, were more or less infected with the excitement. In consequence shippers lost heavily; farmers either singly or clubbed together lost heavily, and one Boston firm I know of went all to smash on account of wild investments in apples.

POINTS TO OBSERVE.

In shipping apples to a foreign market as much, if not more, depends upon the state of the market as in the condition of the fruit, whether your returns will be large or small. If the markets are glutted or even overstocked, good sound stock arriving in good condition must necessarily sell lower than it otherwise would, and if a large proportion of the stock arriving out is soft, poor, or inferior, your stock, however good, will be affected and sell still lower. Therefore in shipping fruit the markets must be carefully studied from week to week, and, if possible, from day to day. Several other things must be considered. Freight charges, insurance, primage, dockage, cooperage and commission charges altogether count up quite a sum, varying from $1.25 to $1.50. In addition to this you will observe that much of the fruit arrives out slack, wet, slightly wet or open, and when that is the case it will sell from one to four or five shillings less per barrel than if marked tight. Getting there tight makes a big difference in the price. I can get more for number two apples arriving there tight than you or anybody else can for choice number one's if they arrive there slack. A large proportion of the fruit sent this season has arrived there slack.

The great secret—in reality there is no secret about it—of success in shipping fruit either to a foreign or to a domestic port, is to know how to pack that fruit in the most attractive manner and solidly. So much has been said and written upon the subject of packing that it seems almost useless to say more. In packing first-class fruit, select the largest and highest colored apples to face the barrel; then place about one-half bushel of those nearly as good close to them and fill up with first-class fruit only. Some make but one grade, when, after observing the first two requisitions, they fill up with first and second class fruit mixed, a very objectionable method. Let your ones be ones and your twos be twos, but in packing twos it is better to select medium sized and good colored ones to face the barrel, putting about a peck or one-half bushel of pluggers close to them and filling the barrel with regular stock.

How to pack and press in this fruit so as to be solid and arrive out tight is quite a trick but those who know how can do it nearly every time; that is, barring accidents, they are reasonably sure of its arriving out tight. It is useless, however, to attempt to tell just how to do it; everybody must learn themselves through their own experience, or by observing those expert at the business.

IGNORING THE TWOS.

Some people say a number two apple should never be shipped abroad or to any market, and a good many buyers this year refused to purchase any but number one apples. This is all folly. People who talk that way really don't know what they are talking about. If there were no number two apples raised that would simplify if not settle the matter, but there always have been and there probably always will be number two apples raised. If everybody would evaporate or make into vinegar, or feed to their stock their number two apples that would reduce the amount of salable stock and advance prices, but everybody won't do it, for evaporated apple is low enough now; there would be no profit in making more cider-vinegar when that already made will not sell at paying prices, and the feeding value of apples is too small to be considered. Moreover number two apples sell better in foreign than in our own home markets and frequently bring much more than they would if evaporated.

They sometimes sell abroad within one shilling or one shilling sixpence of the best and as long as that is the case no one will be willing to throw away or evaporate that class of apples. There are too many of them. We are perfectly willing our neighbor should throw his away, but are not at all inclined that way ourselves. In order to get over the difficulty I have heard some farmers say they didn't have any number two apples this year or none to speak of. All I can say is, I should hate to buy that man's apples at his way of thinking.

Taking all things into consideration, I would advise orchardists, unless they have large lots whereby they can cover several months in shipping, to sell to good parties on this side rather than to assume all the risks themselves. Ordinarily there is too much risk for a small shipper on an uncertain market. One may strike a prize and one may draw a blank. It is too much like a lottery. From my own experience and that of many others I cannot but draw the conclusion that it is better to sell to a good commission house or to reliable parties constantly shipping.

DISCUSSION.

Q. Do you ship apples in barrels or cases?

A. I wrote to a gentleman across the water who wanted me to ship direct to him, a broker and commission merchant on the other side, and he wrote me not to ship them in cases.

Q. I would like to inquire what the condition of apples is when they are wet?

A. Well they may have acquired that by being on board the steamer where they absorb moisture and may have been wrinkled up a little. They may have acquired that by pressing in too many.

Q. How do you understand apples are sold in the foreign market?

MERRILL—I understand the apples are poured out there for the benefit of the dealers as well as the auctioneers; there are long tables running along and the dealers come up and buy them for themselves or for others doing a retail trade. When they buy those apples they open them up and they want them to look nice, and when people come along and see a barrel with nice large apples they want to see if they are good down in the barrel and they poke down into them; and if they are good they like to get that same brand the next time they come.

I noticed a report of the meeting of the New York Horticultural Society in which some of them found fault with the growers of fruit and said the trouble was there were too many varieties sent across the water and they did not pack them solid enough. That is true. There are too many apples loosely packed and it hurts the market as much as over-production.

Q. What are apples worth for fattening purposes?

A. I have fed hundreds of bushels of apples to hogs, but I never fattened one yet on apples. I don't care what you feed them to there is no fattening to apples; a boy will sit down and eat a peck, but he will eat just as much dinner afterwards as a man would.

A large fruit grower that I know went into the evaporating business and after he got well under way I said to him, "How much will it cost you? About five cents a pound to evaporate this fruit. How will you get out of it?" "Well," said he, "I am going to make a choice article." But if everybody went into evaporating fruit where would we be? That wouldn't make any more fruit and if the crop was evaporated there wouldn't be any more buyers. There are a great many number twos and we are perfectly willing our neighbor should throw his away, but we are not at all inclined to throw ours away. I have heard men say they only had number one apples. I only thought I should hate to buy their apples.

BRIGGS—Why can't you explain how to pack apples? The ordinary man understands how to pack apples; all there is to it is to pile in the apples and put in half a bushel or three pecks to make it square to go across the water in a tight condition and so continue it till the barrel is full, and properly filled the barrel will arrive in good condition. This is the experience of all shippers.

ATHERTON—The first year we shipped my fruit sold well and the prices were satisfactory; but again I noticed a good many marked flat and the prices were of course less. Well I found we had got to do something so I sent them more solid, and out of three crates I had only three marked lacking. Then a man came from Boston and he could head more apples than any other man I ever saw. He made me round them up and then press them in together and walk the barrel back and forth till I jounced them together. I said I am afraid you are going to spoil the apples by pressing in too many; well, he said, I am going to have them tight any way, and I will write you of the condition your apples arrive in. The firm wrote "the 'AA' (the mark I had for my apples) show very careful packing and are the only apples that have been well shipped."

THE FOREIGN APPLE MARKETS.

By Alfred W. Otis, Boston.

(In the absence of the writer the paper was read by Mr. W. P. Babb of Portland.)

I understand from the programme that my subject is to be "The Foreign Markets," but I have taken it to be more particularly the foreign apple markets.

American apples have been exported to European markets for a great many years but my personal experience dates back only to the season of 1880-1881. The exports that season from all American ports were in round numbers 1,300,000 barrels and many weeks the quantities were limited only to the carrying capacity of the steamers. From that time the business has grown in almost every particular. The steamship companies have done much to cater to the interests of the shippers and in building their new steamers have given particular thought to the necessities of the apple carrying trade.

In 1880 the shipping from New England was almost wholly done by the dealers in and around Quincy Market, Boston, and an issue of fifty circulars would supply each shipper with the latest information. Now instead of fifty local shippers there have been this season not less than six to eight hundred different shippers from various parts of New England, sending their consignments on Boston steamers alone.

Many farmers, believing that they might as well have the profit themselves, which they supposed of course the speculators received, have shipped their apples, and in some cases have realized not the profits, but the sad fact that "All is not gold that glitters." In some sections the entire crops are forwarded and sold for the growers' accounts, while in other localities the apples are bought up by speculators and I am free to say that in some respects the speculator has the advantage. He handles not the apples from his one particular orchard regardless of the quality, but he naturally looks for the best which he obtains upon as favorable terms as possible. If in shipping only from one orchard, his apples happened to arrive upon a low market, his account would of course show a loss, but as a speculator he follows the market and soon has an opportunity to recover his losses and comes out with a balance on the right side.

The foreign outlet for our apples is confined almost wholly to the markets of Great Britain. The most important market is Liverpool, then comes London, Glasgow, Hull and lately to a very small degree Manchester and Bristol.

As Liverpool is the most important I will give that market my particular attention. It is important on account of the superior transportation facilities which it has in the way of many lines of large and fast steamers from New York, Boston and Montreal, and in the winter season from Portland; also because it is a large distributing centre to the large markets of Manchester, Birmingham, Leeds and other cities throughout England. Immediately upon being landed in Liverpool, apples are sorted according to marks upon the dock and different selections made according to the tightness of the packing; the different terms being "tights," "slack," "slightly wet," and "wet," the term "wet" indicating that the barrels show wet upon the sides or ends from the juice of the fruit and not wet with salt water (as some people suppose); "wet" or "slightly wet" shows to the buyer that the fruit is to a greater or less extent decayed. After selections are made, samples of each and every mark (usually about four barrels out of a 100 barrel lot) are sent to the sales room. In this one room all the brokers, or as we would call them, auctioneers, take turns selling their apples. Here all the apples as well as other green fruits importd into Liverpool are sold at auction.

The sales room is arranged something after the plan of a theatre, the auctioneer and their clerks on one side, while the buyers occupy seats arranged in circular rows on the other, and in the centre, that is between the seller and the buyers, is the elevator up on which samples come up from a room below. These samples are opened, part on the faced end and part on the pressed end and then emptied into large baskets, thus showing fully the contents of the barrels.

The sales take place every Monday, Wednesday and Friday, and are attended by buyers representing dealers from all over England and when conditions are favorable from some places on the continent. It is owing to the system of selection which is followed allowing buyers to reject any but the "tight packed" packages which allows all England to become a buyer in this one room. If compelled to take all of a mark, whether "tight," "slack," or "wet," the out of town buyers would not buy at auction but would buy second handed where they could get only such fruit as could be safely shipped to their inland markets. With 250 buyers in one room ready to bid for such fruit as may meet their wants, it is very evident that better prices will be realized than if the bidding was confined to the comparatively few dealers in the city of Liverpool. It is true that the prices realized are not always satisfactory to shippers but this is also true of the fruit business in any market and the commission business in other lines as well. I believe it can truthfully be said of Liverpool that it has the best system for handling immense quantities of perishable merchandise of any market in the world. In London, Glasgow and the other markets the trade is not so concentrated and the demand is principally for local consumption.

The question is often asked why England does not raise its own supply of apples. The climate is such that it is impossible to grow the varieties such as we have and such as are grown there do not have the keeping quality of the American apple. Theirs are green varieties and are usually well out of the markets early in October. A year ago last fall the English crop was the largest on record and very little demand was anticipated for American fruit, but as soon as the good sound varieties appeared there was at once an active demand which continued throughout the season at comparatively high prices.

The principal apple of commerce is beyond all question the Baldwin, which is usually the standard of quotations. The apples commanding the highest prices in England are the Newtown Pippins shipped from a small section in the Hudson River Valley; these have at some seasons sold at over seventy shillings, that is $17.00 to $18.00, and two years ago one shipper received, net, clear of all expenses, over $1,400.00 for 200 barrels of apples, part of which were seconds. Other varieties that meet with a good demand as long as quantities are not excessive are Ben Davis, Greenings and later in the season Russets.

This year has been one for the establishment of records. It opened with the earliest shipment ever known, being sent early in July from New York. The heaviest single shipment that ever crossed the Atlantic was over 25,000 barrels on the steamship "Scotsman" that sailed from Boston on the 27th of November. The heaviest weekly shipment on record was the total for the week ending October 10, being over 182,000 barrels from all ports. The total shipments from all ports are altogether over 2,500,000 barrels or a million barrels more than any previous year. Boston has shipped already over 900,000 barrels and will have shipped before the end of the season considerably over 1,000,000 barrels. The largest quantity ever received at the port of Liverpool in one week was for the week ending October 24, being over 107,000 barrels. The supplies during the month of October were on an average of 12,000 barrels daily. The total receipts in Liverpool up to the 6th of this month were 1,266,262 barrels. These figures give a slight idea of the influence that the foreign markets have upon the interests of the farmers and the apple growers of this country. When prices seem low we may well ask the question what would become of the American apples if it were not for some such outlet?

As regards prices, this season cannot be said to have been generally satisfactory up to the first of January. The season opened unusually early and shipments consisted of early varieties which were not sufficiently good to attract a demand in the English market. During October enormous shipments were made in very hot weather and landing in very poor condition, the prices were disastrous in the extreme. Later in October there was a slight improvement in the quality and some falling off in receipts and prices showed an advance. Just at that time, however, all the growers and shippers hurried shipments forward to avoid freezing with the result that the markets were glutted worse than they had been at all during the season. This glut continued up to the end of December, many shipments realizing very little and in some cases absolutely nothing over and above expenses. The low prices caused shipments to stop almost entirely and the markets having a chance to react prices have since been very satisfactory. It is quite evident that if the shipments this season had been confined only to the best quality and the seconds and poorer grades had been disposed of or even thrown away at home, more would have been realized for the crop than the actual figures show.

It is impossible in a paper of this kind to cover fully all points connected with the foreign apple markets but have endeavored to give the members a general idea of conditions attending the exportation of apples.

DISCUSSION.

WHITTIER—Do buyers in that sales room have a chance for close inspection of the apples?

A. As I understand it they do. I judge partly from the way the fruit is sold in Boston, that our auctions are carried on something as theirs; the fruit is all landed on the wharf and the fruit branded; you can very easily tell whether they are in a sound condition or not, if they have begun to decay they will look wet. They have catalogues and every buyer is furnished with a catalogue; these catalogues are left blank and the prices are not carried out. These are printed on stiff paper. A man takes his catalogue and goes to the wharf and every man has some way of ranking the fruit; some will use one hundred dollars and some one hundred as the average grade of fruit. This is his estimate of the fruit.

I think the only opportunity for an inspection of the fruit is in the sales room. He looks the fruit over and marks it off according to its rank. He then goes to the sales room and there he has a chance to inspect it; he opens his catalogue and if they are selling No. 1 he simply takes his catalogue and refers to how it looked on the wharf and then makes the foundation of his bid. He bids on tight packages but you know when the demand is good a man will take packages he wont when the market is dull; then the catalogue will go back with more slacks; there are no more slacks reported than there are but if a man makes up his mind he can make a profit on the slack apples he don't say anything about it. They bid on those apples in reference to getting tight packages and they have the privilege of rejecting the slack ones if they buy five hundred barrels, but he can't take less than twenty and if the rest are all right he has got to take his twenty barrels; it is for that reason that Mr. Otis speaks of the farmers guaranteeing their stock; you have got to in some way stand responsible, if you don't, it will drive in another man to intervene between you.

If the farmer has apples enough he could get just as good returns as anybody. Of course the apples are what the buyers are after; here is Mr. Merrill who is shipping apples every week and if he is noted for putting up the best apples that go too Liverpool he will get the run of the market. There is a good deal in packing apples to go across the water; I have been connected with the apple business ever since I was a boy on the farm, I have bought and packed them and every apple man says he cannot see why so many slack apples turn out this year; last fall the apples that were supposed to be the hardest came in wet, but people said they took just as much pains as usual in packing them. Last fall we had very warm weather and the apples shrunk up; one man said his apples shrunk about one barrel in ten. That don't pay.

A great many people press their apples enough but they don't get them in right, most people make a cone and press them in so tight and firm they gradually press toward the outside; the right way is to press them so every apple will tighten together, in the other way your apples are all mush and you make your wet and slack apples all through your barrel. Of course as we turn apples they will pile up and leave spaces, as you turn in your apples turn in one-half a bushel and shake it down and turn in another half bushel and shake it down; that shaking should be the only shaking, shaking as you put them in.

Mr. Atherton—Apples have been packed real nice and before they got across the water they were wet, probably on account of careless handling on board the steamer.

Mr. Babb—There may be cases where that is true but a great many boats are going across the water and I don't think you will find them rolling their apples as much as they used to. The steamship people see that it is for their advantage to land their apples in good shape. We have some boats that apple shippers will shun; somtimes we will hold back a shipment so they will not strike a boat that don't land their apples in good shape and the men have taken an interest and built their vessels so they can take the apples across in good condition.

Mr. Knowlton—Who are the buyers there, jobbers, retailers or consumers?

A. I perhaps cannot answer that, but I think I am correct in my idea that they are both of them. If a retailer thinks it will pay him he will go there. If a retailer thinks it will pay him in Boston he goes to the auctions; I think it is likely the most are jobbers, but there is nothing to restrict the retailer if he buys.

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