Public Documents of Maine:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

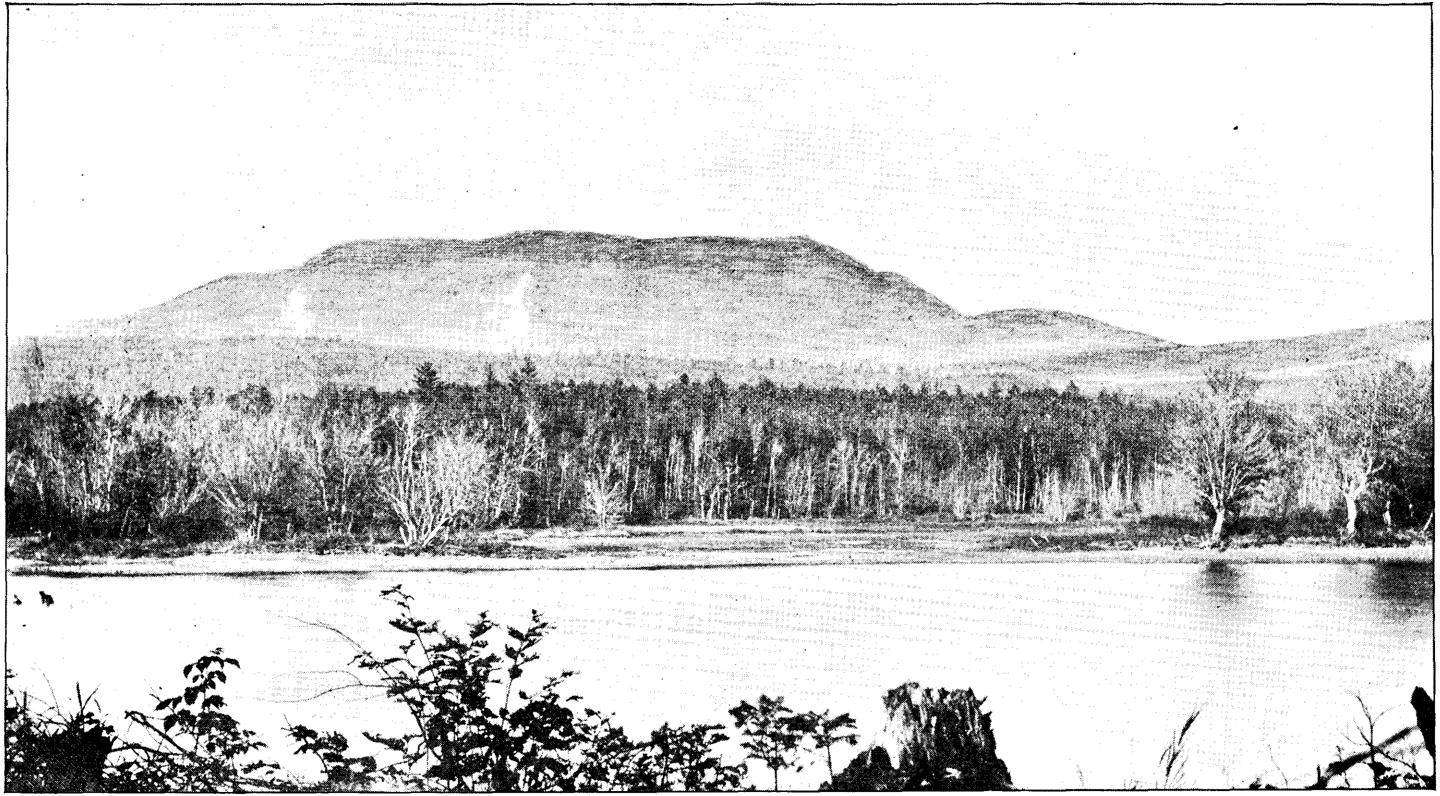
Public Officers and Institutions

FOR THE YEAR

1896.

VOLUME I.

AUGUSTA
KENNEBEC JOURNAL PRINT
1897



Mt. Katahdin from Ebol Stream. 5,385 feet high. The highest mountain in Maine.

AGRICULTURE OF MAINE.

THIRTY-EIGHTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

BOARD OF AGRICULTURE,

FOR THE YEAR

1895.

PRINTED BY ORDER OF THE LEGISLATURE.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1896.

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 1895.

B. WALKER McKEEN, *Secretary.*

AUGUSTA, May 1, 1896.

MAINE BOARD OF AGRICULTURE—1895.

OFFICERS.

L. G. SMITH, PRESIDENT.
W. H. VINTON, VICE PRESIDENT.
B. WALKER McKEEN, SECRETARY.

MEMBERS CHOSEN BY COUNTY AGRICULTURAL SOCIETIES.

				Term expires 3rd Wed. in January.
Hancock	County.	Vacancy.		
Androscoggin	"	B. F. Briggs,	Auburn,	1896
Kennebec	"	F. H. Mooers,	Pittston,	1896
Waldo	"	W. H. Moody,	Liberty,	1896
Washington	"	L. G. Smith,	Pembroke,	1896
Lincoln	"	John M. Winslow,	Nobleboro,	1896
Cumberland	"	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

MEMBERS FROM STATE COLLEGE.

President, A. W. Harris, Orono.
Prof. W. H. Jordan, Orono.

ELECTED BY THE BOARD.

B. Walker McKeen, Secretary.

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.

ANNUAL MEETING, 1896.

The annual meeting of the Maine Board of Agriculture was held at the rooms of the Board, State House, Augusta, January 15th and 16th, 1896.

WEDNESDAY, A. M., JANUARY 15.

Meeting called to order at 11 o'clock by W. H. Vinton, Vice President.

Mr. VINTON—The Board of Agriculture for the State is now again in session at its annual meeting. In looking over the past year I think that the members of the Board may see very many things upon which they may very properly congratulate themselves. Not least among the things for which we are glad and thankful is the fact that we shall not be under the necessity at this meeting of participating in any memorial services. No members of the Board have died the past year; so far as I know none have been seriously sick. You have all been able, in your respective counties, to attend to the duties which devolved upon you.

Another thing upon which I think the members of this Board may well congratulate themselves is that during the year now closed we have done very much more service, and, more especially, very much better service to the cause of agriculture in the State than has ever been done in any former year of the existence of this Board. I speak with great assurance. We have done more and better work in the institutes than ever before. The institute work has been of a higher order, it has been much more appreciated and the results have been much more marked. This is true especially with reference to my own county. We have as yet held but one Institute in Cumberland county, but I think we may hold one or two more soon. The one Institute that we did hold was worth as much as all the rest that have ever been held in my county since I have known anything about the Board; and has actually done more for the farmers in the vicinity in which it was held than all the others put together. I was informed by a man who was instrumental in getting it up that five silos have been started already as a result of that meeting. He said also that Gov. Hoard left with him some copies of "Hoard's Dairyman" and he gave copies to six different farmers in his neighborhood and five of them have given their names to send on as permanent subscribers.

I hear upon all sides that our dairy meeting held at Norway has resulted in more inquiry, more activity and more energy among the dairymen in that vicinity. The result of this meeting is more marked than that of any other dairy meeting that we have ever held. I think we may safely, in reviewing the past year, congratulate ourselves upon very many things. I think the cause which the Board has in charge is better appreciated than ever before. There is less ridicule about book farming and the importance of science as applied to agriculture, very much less as a result of this year's work; and for the next year we may take new courage.

Records of the last Annual Meeting were read and approved.

Committee on Credentials, appointed by the Chair, T. E. Skolfield, L. O. Straw, W. H. Snow.

Committee on Pay Roll appointed in the same manner, C. E. Wheeler, W. H. Moody, J. W. Dudley.

On motion of Mr. Wheeler voted that Mr. A. R. Smiley act as messenger for the Board during this session.

The Committee on Credentials reported the following named gentlemen as duly elected members of the Board: J. M. Winslow of Lincoln county, B. F. Briggs of Androscoggin county, W. H. Moody of Waldo county, A. R. Lincoln of Washington county and W. G. Hunton of Kennebec county, each to serve for the term of three years. This report was accepted and the several members declared entitled to seats on the Board.

Committee to receive, sort and count votes, appointed by the Chair, B. F. Briggs and E. E. Light.

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

Adjourned until 2 o'clock, P. M.

WEDNESDAY P. M.

Mr. VINTON—Last year we discussed the question of a Farmers' Field Day on the plan adopted by New Hampshire. New Hampshire has holden for a series of years what they call a Farmers' Field Day; a three days meeting which has come to be a very interesting and profitable meeting. I have become convinced that we ought to have such a meeting for Maine, and our proposition was to hold such a meeting, and to hold it (if we could as well as not) at Old Orchard, and to hold it in August when all the summer travel is on and Old Orchard is in life; by which we could accomplish two things. We could have a Farmers' Field Day, which we would make a great success, and in addition to that the farmers with their wives and daughters could go to Old Orchard, where everybody likes to go, and spend a day or two. Our plan was to have two of these days farmers' days, the first and the third, and to have the second day a Grange Day, given entirely up to the Grange, they to have the entire charge and responsibility of it. I wrote to Brother Straw, and we looked the matter over, but we found that there was so much involved in such a meeting that we hadn't time to get it up for last year. Now Brother Wiggin has come in, and he is at the head of the Grange, and attended this Field Meeting in New Hampshire on Grange Day last summer, and I think we may as well ask him to give us some little idea of the New Hampshire meeting and his opinion in regard to such a meeting as this for Maine this year.

Mr. WIGGIN. Mr. PRESIDENT—I was invited by the Secretary of the Board of Agriculture and the Master of the New Hampshire State Grange to attend their Field Meeting last summer and speak to them on "Education in the Grange." They have practiced holding these meetings, I think, for a number of years, the Board of Agriculture and the State Grange in conjunction, making it a Farmers' Field Day. I think there was one day devoted to the Grange and two to the Board. They call together quite a number of speakers, who speak on subjects in which farmers are interested, and it makes a very pleasant, instructive and interesting meeting. As far as I was concerned, I enjoyed it very much indeed, though I was not able to be there during the whole of the meeting. The last afternoon I think they had a steamboat excursion down the lake and that was, of course, very interesting to those who could take it in. As far as I am concerned personally, if such a meeting could be brought about anywhere in the State of Maine I should be very glad to encourage it by any means in my power, and would do all I could to bring the influence of the State Grange to the assistance of the meeting. Of course it requires some work, and if it is to be carried on by the Board and the State Grange jointly, there would have to be some meetings to discuss preliminaries. But I pledge this much, that the State Grange will do its part towards making a success of any such meeting. In New Hampshire the Master of the State Grange, who is also Secretary of the Board, calls upon his members in the work to go to that meeting, and as far as I have known they have always gone by merely having their expenses paid. I have no doubt but that Brother Bachelder and other members of our New England granges would be willing to go to a meeting of that kind by merely having their expenses paid.

Mr. McKEEN—How did the attendance and interest at this meeting compare with our average Institutes?

Ans. The attendance was not quite as large as I expected. I do not know how much the meeting was worked up, but I was rather surprised that the attendance was not larger. However, it was very select, the best farmers of the State were there. I met men there who are interested in all branches of agriculture.

Mr. VINTON—If we should hold such a meeting and hold it the next week after the meeting in New Hampshire, I think we might move quite a portion of their programme and their speakers right down with us. That is a matter that we want to consider at this meeting.

REPORT OF THE SECRETARY.

MEMBERS OF THE BOARD OF AGRICULTURE: In making another annual report to you as Secretary of this Board, I am pleased to say that I believe the agricultural progress of our State has been fully maintained during the year just past. We have been visited by no destructive plagues, droughts, or floods, and the labors of the husbandman have, in the main, been rewarded by ample returns, in fields and homes. While the farmers of Maine are, as a rule, keenly alive to the necessity for advanced methods in conducting all farm work, and the advantages to be derived from specializing, they are still more fully aware of the benefits which they get from the privileges of the home, and of the general luxuries which a well conducted farm affords.

We therefore observe as time advances, a more and more full development of all that goes into the home, and with this development comes, as a correlative force, an elevation of character that counts far more for true success in life than mere financial success.

The general farm prosperity which we note in Maine, we are pleased to see extends in a greater or less degree over the entire country, and although many of our farm products are selling at low prices in the markets of the world, still we see that there is no cessation of the business in any section, but that a fair activity pervades the entire country, along all agricultural lines.

We quote with pleasure a few words from the Report of the Secretary of Agriculture at Washington, which we think should have great weight with all, both the old and the young, in creating a sentiment in favor of the farm and farm life, as well as in establishing the fact that prosperity awaits the industrious, intelligent tiller of the soil.

He says, "The farms of the United States, averaging 137 acres each, are valued at more than $13,000,000,000. Those farms number four million five hundred and sixty-four thousand six hundred and forty-one (4,564,641,) and their average value in the census of 1890 is $2,909.

The farm family, including hired help, averages six persons. By their own labor, with an additional investment upon each farm of about $200 in implements and $800 more in domestic animals and sundries (making a total farm plant of $4,000,) those families made for themselves during the year, out of the products of the earth, a wholesome and comfortable living.

The same farmers have, with part of their surplus products, also fed all the urban population of the United States, poor and rich alike. Cereals, meats, vegetables, fruits, eggs, milk, butter, cheese, and poultry have been supplied the village and city markets of the United States in abundance. It is probably safe to say that more than 40,000,000 of American citizens not living on farms, have been so furnished with all the necessities and luxuries known as products of the varied soil and climate of the states and territories of the Union.

During the fiscal year 1895, the United States exported to foreign countries, domestic commodities, merchandise, and products aggregating in value $793,000,000. The aggregate value of the agricultural products included in that sum was $553,215,317.

Thus American agriculture, after feeding itself and all the towns, villages, and cities of the United States, has also sold in the outside world's markets more than $500,000,000 worth of products. So the farmers of the United States have furnished 69.68 per cent of the value of all the exports from this country during the year 1895."

"In the presence of these facts, in the face of these figures demonstrating that agriculture in this republic has, during the year fed itself, supplied all citizens of the Union engaged in other vocations, and then shipped abroad a surplus of over $500,000,000 worth of its products, how can anyone dare to assert that farming is generally unremunerative and unsatisfactory to those who intelligently follow it? How can the 42 per cent of the population of the United States which feeds the other 58 per cent and then furnishes more than 69 per cent of all the exports of the whole people, be making less profits in their vocation than those whom they feed when the latter supply less than 31 per cent of the exports of the country?

"For the purpose of illustrative comparison transfer the $4,000 agriculturally invested in each farm of 137 acres to the choicest Wall street investment. Risk that money in railroad first mortgage bonds, in bank stocks, or any other allegedly safe security which may be found a favorite among shylocks, brokers, plutocrats, monopolists, money-power manipulators, and multi-millionaires, and if it returns six per cent it is a remarkably profitable investment in the eyes of capitalists. Therefore $240 is the annual income.

"Follow the transfer of the farm money with that of the farm family to urban residence. Now, with the same labor in the city or village can they attain by hard work every day in the year, adding their wages to the $240 income, as much of independence, wholesome living, and real comfort as the same amount of money in the land, and the same heads and hands working on the soil, generously and healthfully bestowed upon them, in the sweet quiet of a home, amidst flowers, trees, fruits, and abundance on the farm?

"It will be observed that between 1880 and 1890 the proportion of the people engaged in agriculture declined two per cent, and that to-day there are only 42 persons in rural pursuits to 58 in mercantile, manufacturing, and other callings common to the great populational and industrial centers. Fifty-eight per cent of the people cannot always be satisfactorily maintained upon the profits of exchanges among themselves in the villages and cities. Food for all, must come from the earth, from tilled fields. The population of the United States in 1915—a quarter of a century after the census of 1890—admitting that the increase will diminish very materially as compared with that of each preceding quarter of a century since the government was established, will, no doubt, number at least 120,000,000.

"The value of farm lands, being governed by the relation of the supply of those lands to the demand for them, will therefore steadily increase. The area of supply remains stationary, or from careless tillage decreases. But the added millions of our population augment and intensify demand. Therefore the prices of farms must in the next twenty years, and possibly in ten years, advance more markedly than those of urban real estate. The owners of fertile fields, however, must understand now that agriculture is swiftly becoming a scientific profession. The more the farmer cultivates his mind, the better and more profitably, he can cultivate his fields. The Department of Agriculture has expended during each of the last two years, a greater per cent of its appropriations in the application of science to farming, to correct tillage and fertilization, than ever before.

"Each season teaches anew the imperative necessity of more and more scientific knowledge for those who are to plow and plant profitably. The markets of the world will finally be invaded, captured, and held by those who produce cereals and meats, vegetables and fruits at the least cost, and can therefore most cheaply sell."

We believe the Secretary touches the key note for successful agriculture in this country, in Maine, in these few calculations. It is exceedingly gratifying to note that a large proportion of our farmers are more and more appreciating the necessity for more "scientific knowledge." This fact is apparent in the increased demand for speakers having a scientific training for our Institutes, and the larger number of subscribers to our agricultural papers, as well as in the increased demand for our reports and other publications of the Board.

The season of 1895 has been a somewhat peculiar one from an agricultural standpoint. Although there was a severe and protracted drought in the earlier part of the season, our crops appeared to suffer but little, and rapidly pushed forward to a full and abundant harvest. This was true with all except the apple crop, which with but few exceptions, was very light. The year of 1895 will pass into history as one in which Maine produced the largest potato crop known, which has proved in some cases a source of poverty in the midst of abundance. It will also, we believe, mark a new era in our agricultural progress, for the reason that the lessons which it has given the farmers will, if heeded by them, tend to intensify the desire to produce more of the finer products of the farm and less of the coarser products, to put more skill into the work and to more diversify our products. We believe these moves will add materially to our prosperity, and decrease very decidedly the proportion of unprofitable production of any crop.

OUR LIVE STOCK.

Never has our farm stock shown better in condition or in profits. The abundant harvests of hay, grain and corn, which is being put into silos more largely each year, have given our feeders plenty of food for their animals. Less purchased grain is being fed than formerly, and the general character of the feed is being improved. Our dairy animals are at last increasing in numbers and in average productiveness, our young stock has increased in number and in average value. While but few horses are being raised, there is a healthy tone to the industry, and what are now being raised are far more in accordance with the demand of the market than formerly, and we feel confident that with the increased interest that is now being manifested, and the better knowledge of the rules governing successful breeding that is everywhere apparent, we shall soon be chronicling a rapid increase in successful horse production.

The sheep industry of our State, although somewhat crippled by the low price of wool, where the business has been conducted in the State the past year in accordance with the demands of changed conditions, we believe from the reports which have been received at this office, has afforded a reasonable income on the capital and labor expended. We note two instances where a flock of fifty or more grade sheep have returned an income of more than one hundred per cent on the original cost, besides maintaining the value of the flock.

There is an increasing demand for practical lectures on the poultry industry, and we look for a more rapid increase in the productions of the poultry yard than in former years.

EXECUTIVE COMMITTEE.

The executive committee have had but one meeting during the year except those at the State House during the session of the legislature. They have been consulted as much as possible by letter and by personal conference, and have given much thought and attention to their duties, and have been of much assistance in the work.

COMMITTEE ON LEGISLATION.

This committee, which was formed at our last annual meeting, and consisted of W. H. Moody, F. H. Mooers and T. E. Skolfield, met at the rooms of the Board on January 22d, and drafted an amendment to section 3 of chapter 297 of the laws of 1885 relating to the sale of unwholesome foods, an amendment to section 11 of chapter 186 relating to State aid to agricultural societies, prepared a resolve in favor of printing 12,000 copies of the reports of the Board all bound in cloth, and a resolve urging more pay for clerk to Secretary of Board, all of which became law, and have been placed on our statutes.

FOUL SEED.

Complaints continue to come to the office relative to the impurities of our seeds; particularly is this true of our grass seeds. Farmers, we find, are too much inclined to purchase seed where it can be obtained the cheapest, and are consequently cheated in quality. We do not lay this at the doors of our seed dealers to any great extent, but believe they are often deceived themselves in the seed they buy, aiming as they do to secure it at prices which will ensure its sale in competition with that on the market. It is to be regretted that farmers will not take advantage of the seed testing which may be obtained free of cost at the Experiment Station, both for impurities and for inferior seed, which may be true to name, but is not vigorous either from age or other causes.

We call this matter again to the attention of the Board, thinking perhaps you may wish to take some action, or make some recommendations, looking toward seed inspection or toward informing the farmers more fully as to the necessity for pure and healthy seed.

CROP BULLETINS.

The publication of our crop bulletins has been continued for the past season. The circulation has increased, without solicitation on our part, from 4,300 in 1894, to 5,500 for the mailing list and for exchanges in 1895. Our last issue was exhausted before the demand was supplied, and we have been obliged to write quite a large number of applicants that the supply was exhausted. This list must be increased materially during the coming season to keep pace with the demand. We wish to take this opportunity to thank in a public manner the members of the Board and others of our correspondents, who by their prompt, painstaking and valuable replies have made these bulletins what they are.

OUR DAIRY INTERESTS.

The matter of controling in some degree the methods of dividing the proceeds from our creameries and butter factories was considered at our last annual meeting, and action taken looking toward a more just and equitable apportioning of the proceeds. In line with this work of the Board a bill was introduced and pushed through the legislature by Mr. Z. A. Gilbert, Ex-Secretary of the Board, which requires the testing of all articles used in connection with the Babcock test in these factories, and that all persons using it for commercial purposes shall pass an examination before the Superintendent of our Dairy School, and receive a certificate from him of fitness for the position. This law is having a good effect, and we hear fewer complaints than formerly as to improper handling of the test and consequent unfair results.

Through the active co-operation of our friends in the legislature, a law regulating the sale of oleomargarine was passed, practically the same as that recommended by our legislative committee. In passing this law we have taken a stand abreast of the other New England states, and acting in conjunction with them have been able to control the sale of these bogus goods to quite an extent. I quote from the market reports, "The receipts of oleomargarine at Boston for the year 1895 were 28,949 packages against 180,370, packages in 1894, a decrease of 151,421 packages; making the receipts of 1895 only 16 per cent of those of 1894." This large deduction in the receipts of this article must have assisted materially in increasing the consumption of butter.

As we look over the field for production and the increasing consumption of the various products of the dairy, we believe there never was a brighter outlook for the business.

The schemer has ascertained that Maine is a good field for him to work, and about one year ago began his nefarious business of attempting to place creameries at very high prices in every place he could, regardless of the needs of the locality. Notwithstanding the earnest opposition of this office they succeeded in putting in two of these creameries in sections where the needs of the dairy business were not fully understood. It is needless to say that both of these buildings are standing idle to-day, and that the prospects for their doing business in the near future are very poor. This Western firm has now failed for $200,000, and, I am informed, has several suits for obtaining money under false pretences, on its hands.

THE PRESS.

The Department is still under great obligations to the press, particularly the agricultural press. Much pains has been taken to extend notices of our meetings, and quite full reports of most of the important ones have added much to their value.

EXCHANGES.

Our exchanges remain the same as last year. We value particularly the bulletins from experiment stations and find them of much interest and of great importance to us in our work.

INSTITUTES.

Before going into the details of the Institutes I wish to acknowledge the great assistance which the members have rendered in the work, and to again urge upon all the necessity for much local work in planning and perfecting the meetings. If any new efforts shall be made or new lines of work marked out the coming year I am quite sure one of them should be along lines of better advertising and better drawing out the interests of the people by the local member. We believe this duty has been too much overlooked in many instances in the past, and think members can in no way add to the efficiency of the work better than by actively canvassing their own counties for this purpose.

We have made no radical change in conducting the Institutes, except perhaps to work more into places where they never have been held before, believing that by so doing we can extend our work and reach people which we could reach in no other way. The permanent record of these meetings and the costs of each has been continued.

The time reported covers the Board year, from the third Wednesday in January 1895, to the third Wednesday in January, 1896, and they are as follows:

Riverside, Foxcroft, South Norridgewock, Limerick, West Kennebunk, Brunswick, Union, Damariscotta, Waltham, Ellsworth, Bucksport, Carroll, East Vassalboro, North Fayette, West Winterport, North Searsport, Belfast, Ashland, Mapleton, Caribou, Island Falls, Amity, Strong, New Sharon, East Wilton, Danforth, Charlotte, Cherryfield, Sheepscot Bridge, North Waldoboro, West Rockport, Washington, Cumberland Centre, East Hebron, South Lewiston, Bowdoin Centre, Harpswell Centre, Pittston, Madison, Solon, Harmony, East Sangerville, Milo, Charleston. State Dairy Meeting at Norway, December 4th, 5th and 6th, costing $617.87. Joint Winter Meeting with the Pomological Society at Presque Isle, January 8th and 9th, 1896, costing $200.00. The total number of these meetings is 46, total cost, $1,984.89. Total attendance, 6,210, average attendance, 135; average cost, $43.15.

With the exception of a few bills which have not been secured we are square with the appropriation for 1895. These and the expenses of the Joint Winter Meeting and the Institutes held since January 1st, amounting to about $300, will come out of the appropriation for 1896. Of the balance unexpended for Institutes we have:

Expenses of legislative committee,	$ 33 20
Expenses council and travel on oleomargarine matter	100 00
Paid Wallace Weeks travel and expenses collecting evidence	108 54
Paid W. H. Judkins, prosecution	25 00
Expenses executive committee at legislature hearings	52 70
Expenses State fairs, including evening meeting at Lewiston	74 00
Typewriter	70 00
Stenographer	100 00
Weather bureau	79 00
M. C. Fernald	30 00
Office work	16 00
A. D. Ward	17 80

Holstein herd of Mr. F. J. Libby, of Richmond.

Dick mailer	12 00
G. A. & H. Cony, teams	23 00
Bowditch & Webster	12 95
Incidental expenses	120 16

OTHER MEETINGS.

In addition to these Institutes and State meetings the Board attended the annual Field day at Orono, June 5th, at a cost of $74.15. February 15th, I attended a meeting of farmers at Ellsworth and spoke on the creamery from the farmer's standpoint. A creamery was soon after started there and is now in successful operation. March 29th, attended meeting of farmers at Damariscotta, and spoke on the advantage of the creamery system.* June 5th, attended farmers' Field day at Orono. June 19th, attended commencement exercises at the State College.

August 20, 21, 22, 23, attended Eastern Maine State Fair at Bangor occupying the rooms of the Board furnished by the Society. Took charge of the milk testing, assisted by Prof. Gowell.

August 27, 28, 29, 30, attended New England Fair, occupying an office in the city building, taking charge of the testing as at Bangor. September 2, 3, 4, 5, 6, attended the Maine State Fair at Lewiston, occupying the parlor in the President's headquarters, taking charge again of the milk testing. Prof. Gowell rendered valuable assistance at each of these places.

October 1st, attended a meeting of the Lincoln County Agricultural Society at Damariscotta, and spoke upon the duties and opportunities of agricultural societies.

October 2d, started for a week's trip through Vermont to look into the dairy and creamery interests of that state with a view to obtain information of a helpful nature to the dairymen of our own State.

REPORTS.

In accordance with the recommendation of our legislative committee the number of our reports was restored to 12,000, and all bound in cloth. The last issue has been nearly exhausted and demands for them are constantly increasing.

AGRICULTURAL SOCIETIES.

I visited all of the fairs that I could, consistently with my other duties, and am pleased to report that as far as I could note, there appeared to be an increasing desire to live up to the spirit of the law to exclude gambling, and to elevate in every possible manner the

* Since this report was written, a creamery has been built and equipped by local capital, in this place, and has now commenced operations with every prospect of making it a complete success.

character of the exhibition. I believe, however, that it may be well to have a little closer supervision over this matter, and recommend that the Board take it under consideration and see if in their judgment something should not be done to place the societies and the Board in closer connection.

I believe the new law governing the distribution of the stipend is working finely. The tendency is to drive out those societies which were formed mostly for trotting purposes, and it intensifies the tendency to increase the premiums awarded on exhibition stock and products. I append a summary of some of the totals as returned to this office.

Number of horses and colts exhibited	2,198
Number of sheep exhibited	1,751
Number of swine exhibited	745
Poultry (coops) exhibited	1,205

ANALYSIS OF AWARDS.

Total amount of premiums and gratuities paid	$20,056 03
Amount of entry fee for trotting purses	12,627 61
Amount of trotting purses	30,862 75
Actual cost of the trotting purses	18,225 14
Per cent of entry fees	.41
Per cent of stipend	.3497
Per cent of decrease in awards	.06
Number of societies receiving stipend	52
Increase from 1894	3

I feel it may be well to call the attention of the Board to the means which are available for use in preserving milk and cream from souring. The cream trade of our State has reached immense proportions, and amounts to many thousands of dollars annually; and it becomes our duty to see that designing men do not introduce methods into the business which are injurious to the health of consumers, and of course detrimental to the business in the long run.

It has become known that the souring of milk is due to the action of certain bacteria, and I quote from the report of the Department of animal industry at Washington: "A good idea of the purity of milk may be had by ascertaining the number of bacteria it contains. This number has been found to vary from 10,000 to 100,000 per cubic centimeter immediately after milking, and increases enormously after standing for a few hours at the normal temperature. The first portion of the milking contains the largest number of bacteria per cubic centimeter, the last portion often none at all. If kept on ice the germs do not multiply. The bacteria which produce lactic acid and those which produce butyric acid are most common. The latter, together with certain spore-bearing bacilli present in the dust of the air, are the most difficult to contend against. It is apparent, of course, that some of this contamination cannot be avoided.

The importance of a method or methods of freeing milk from these minute forms of life which cause so much damage, or of rendering them harmless, is evident. Several methods have been adopted to secure this end. The three most important are the use of chemicals, pasteurization, and sterilization, all being employed with the view of destroying the germs without injuring the properties, value, and healthfulness of the milk.

PRESERVATION WITH CHEMICALS.

Bicarbonate of soda is often used for this purpose; but, though this will neutralize the acidity, it rather favors than retards the increase of bacteria. Boric and salicylic acid are of some use in this connection, but both have been found to be injurious to health, even in small doses, if taken continuously. These and other chemical means are therefore neither satisfactory nor advisable.

The cooling of milk is well understood, but the most advantageous method of preserving it is by pasteurization or sterilization. In pasteurization the milk is warmed to 65 to 70 degrees C; (155 to 160 degrees F.,) a temperature sufficiently high to kill the ordinary bacteria and pathogenic germs."

Some states have laws regulating this matter, and I have read of at least one conviction under these laws.

OUR COUNTRY ROADS.

As no class of citizens are more directly interested in having good public highways than the farmer, and as in many sections of our State our roads are not what they should be, I recommend that the Board discuss means and methods for bringing about needed improvements, and ascertain if it will not be wise to be prepared to make some recommendations to the next legislature looking toward bettering the conditions which now exist. Not only should the roadways themselves be improved, but the hedges and outlying borders should be cleared, as in these forbidding recesses lurk the seeds of many foul weeds which are carried by winds and by birds into the fields adjoining. We believe the gravity of the situation demands that some action be taken.

Respectfully submitted,

B. WALKER McKEEN, SECRETARY.

WHAT EXPERIMENT STATIONS ARE DOING FOR AGRICULTURE.

By Prof. W. H. JORDAN, Member from the State College.

Stenographic Copy.

MR. PRESIDENT, MEMBERS OF THE BOARD, LADIES AND GENTLEMEN: I feel quite sure that it might be more profitable for you this afternoon to discuss such executive and other matters as ordinarily come before you at your annual meeting; but I was asked by our Secretary to say a few words along a certain subject, and, as is my custom, I have obeyed orders, and am here.

I am to talk to you a little to-day in an entirely new way, with regard to what experiment stations are doing for the farmer; a sort of address, perhaps, which is less fitting before this audience than before some, because the audience which I see before me to-day is one made up of men and women who know a good deal about what experiment stations are doing. Nevertheless, it may not be out of place for me to talk a little while about this subject, especially about your Station here in Maine, which I know something about. Before saying anything with regard to the special work of the stations, I want, in a few brief figures, to give you an idea of how this experiment station movement has developed in this country. It began twenty years ago in the establishment of the first Station at Middletown, Conn. I knew something about that station at that time, because the first Director had been a teacher of mine during the previous year. And as I was pursuing the long course in agriculture, the full four years course at the State College, I was naturally interested in all those matters, and through him knew a good deal of the struggles and vicissitudes of the attempt in Connecticut to establish that station. You may remember that it was only established through the generosity of a citizen of Connecticut, Mr. Orange Judd. He came forward and with an offer of money induced the legislature of Connecticut to do what they would certainly have refused to do had he not agreed to pay a part of the bills. A little later I was connected with the station as an assistant; and if Providence permits, to-morrow night a few of us who were assistants of Prof. Atwater in that old station, propose to meet at Middletown and have a little jollification, at which Prof. Atwater will be our guest, in honor of the twentieth year of the history of experiment stations in America, and especially in honor of the man who was so efficient in securing the establishment of the first station. There will be at that meeting the chemist of the Experiment Station at Middletown, the vice director of the Experiment Station at New Haven, the Director of the Experiment Station in New Jersey, the Director of the Experiment Station in Delaware, and myself, all of us having served Prof. Atwater as assistants. And, if you will pardon my remark and take it under the old rule that present company is always excepted, I have heard Prof. Atwater pride himself a good many times on having graduated a corps of men to work in these experiment stations such as he has.

These experiment stations have gone on growing from that time. First, states established them, paying the bills out of the resources of the state treasuries; then you know there came in 1887 that movement for national experiment stations; and through the influence of some Maine men, (for we had a man then who stood in a critical position and who is likely to stand again in a critical position, for Mr. Reed was then Speaker of the House) through the influence of Maine men I personally know that a great deal was done towards securing the passage of that bill. The bill passed, and we have now in the United States fifty-five experiment stations. Fifty-one of these are receiving government aid. The income of these stations is about one million dollars annually, between seven and eight hundred thousand of which is paid to them directly from the treasury of the United States. Those stations were employing in 1894, 577 persons, and issued in that year fifty-one annual reports and 401 bulletins, which were distributed to the mailing lists on the books of these stations of about half a million farmers or men interested in agriculture. The director of the Cornell University Experiment Station, Prof. Roberts, estimates that in his state alone the material issued from that station in the shape of bulletins is copied into state papers so that it reaches a half million farmers in a single state. That serves to give you, in a brief way, something of the extent and influence of the experiment station movement.

Now what are these stations doing? I do not know that I can do better than to illustrate what they are doing by your own station. I do not mean to say that the Maine Experiment Station is doing as good work as any other station, or that it is doing as much work as any other station, but that it is doing very much the same kind of work. It is not doing all the work that some would have it do. For instance, I received a letter the other day, transmitted to me through Dr. Harris, written by a very intelligent citizen of this State and one who is thoroughly in earnest, saying that we had always neglected the subject of birds at the Maine Experiment Station; that it was not only right, but our duty, to appropriate a certain portion of our funds to the study of the birds that prey upon injurious insects. And I am constantly in receipt of suggestions (which I am always glad to get) from the citizens of the State as to the lines of work which we should enter into, and they are legion. What are we doing? First of all I will take up what I call the police work of the Experiment Station. In talking about our own Station I may seem to be talking about a personal matter, but I cannot very well talk about the Station without talking about my personal relation to it and the work which I have to do. I include under the term police work our inspection of fertilizers and our relation to the creameries of the State. It may not seem, perhaps, to some of you who simply see the bulletins we are issuing giving the results of our analyses of fertilizers, that we are doing very much to keep up the standard of those goods in the State; but some incidents may serve to illustrate our work, or the value of our work, better than it can be illustrated in any other way. A year ago this winter my attention was called to the sale, or attempted sale, of a fertilizer in Aroostook county which had been compounded along new lines. A certain gentleman in New England had discovered, or had become profoundly convinced, that we were all wrong along certain of our lines of practice in the use of the commercial fertilizers; according to his views we should be using cheap soda instead of the more costly potash in fertilizer plants. A certain manufacturing concern, or supposed manufacturing concern, in another New England state, had taken up with the idea evidently, though just how and when I do not know, and had sent an agent into Maine to sell, at a price very much beyond the value of the fertilizer, fifty-five dollars per ton, to Aroostook county farmers especially, these goods. My attention was called to the matter in two or three different ways, and as the company in question had not reported to the office at Orono, as it is their duty to do by law, I addressed a letter to the firm in which I called their attention to the fact that they had not reported to me the necessary figures, had not paid their analysis fee and had received no license from the director of the station to sell their goods in Maine. I am sure, if I may believe what men tell me, that they had placed quite a good many orders in Aroostook county, but I received in reply this statement: "When we sell any goods in Maine we will attend to the requirements of the law." Now whether the station, together with the aid given it by certain citizens of the State, prevented the sale of those goods, or not, of course I cannot certainly affirm; but I am sure of this, that the agent pulled out and the goods were not sold in Maine. Several times within the history of the Maine Experiment Station, and I have known its history intimately from the first day, similar instances have arisen, and we have shut out of the markets of the State, several concerns that desired to do what I call a fraudulent business within its limits. Again this winter the same thing is being attempted. Aroostook county seems to be the place where such fellows go, whether because they like good company or for what reason I do not know; again this winter a fertilizer concern that has not reported itself to the Maine Experiment Station, has not complied with the law, is offering goods in direct violation of the law. The matter is now being looked up and I am attempting to get into correspondence with the concern, which hails from Rhode Island. I have not succeeded in getting a reply to my letters, but I learn that their agent is still in Aroostook county, and we shall endeavor to set the matter right. So much for the police work which the station is trying to do in this line.

The Secretary of this Board, in his report to you this afternoon, mentioned the new law that was enacted last winter which places with the Director of the Maine Experiment Station not only the authority but the requirement to inspect the apparatus in use at our creameries. Of course I was not able to attend to that personally, and, as the law allowed me to do, I authorized one of the chemists of the Station to do the work, and we have been kept altogether too busy testing apparatus which has been sent to us from the various creameries of the State. I will say, to give you something of an idea of the amount of work we are doing, that one dealer in the State has paid a bill to us of forty-four dollars and some cents for testing flasks at six cents apiece. So you see we have had a great many flasks from that one dealer pass under our inspection. The larger part of the creameries have complied with the law. It is about time for some of them to receive a suggestion and they will very soon be informed that the law was written for a purpose and that they must place themselves right if they expect to do business undisturbed. Now, has the law justified itself? It has. We have had very few lots of apparatus sent to us, in the shape of flasks, pipettes, etc., in which we have not found one or more flasks that were sufficiently incorrect to make them undesirable for use. In one lot of over thirty flasks, sold I believe to the creamery by our friends with whom Secretary McKeen has had more or less cordial differences, we found twenty odd seriously wrong, incorrect to the extent of one or two per cent fat, so that you can see there was need of the law; and those gentlemen who introduced the law, worked it up and assisted in its passage, I believe did good service to the agriculture of Maine, and especially to the dairymen of course, in securing such inspection. We shall issue a statement, which will cover the first year possibly, and possibly the first half of the first year, stating the amount of inspection which we have made and the general results. This State is the only one, with the exception, possibly, of Iowa, that has such a law. I called Gov. Hoard's attention to the law and its operation, while he was here, and he most heartily commended the law and the results attained under it; and he is a gentleman of very large experience in these matters.

Passing from the police work, all of which is maintained at the expense of the State, we will now consider something of the work we are trying to do with the money appropriated by the United States government. I, personally, have some very strong convictions as to what is the proper work for an experiment station. I remember there appeared in a state paper, in the year 1887, I think, at the time the government made its appropriation for these stations, this one sentence, "The new experiment stations should do a great deal of farming," a statement with which I most cordially disagree. It is not the business, in my judgment, of an experiment station to do farming. If there is any serious impediment to progress in agriculture to-day, it is our ignorance of certain fundamental principles. Let me illustrate, and I can find illustrations in animal nutrition more abundant than I can find them anywhere else, for we are dealing more deeply with matters there than in other things, perhaps. Those of you who are familiar with the analyses of cattle foods know that one of the columns in those analyses is headed "Nitrogen Free Extract." What does that term mean? It is used as a name for a class of substances into which is put such materials as starch, sugar, etc. Now if there were nothing found in that class of substances but starch and sugar, our information would be more definite than it is now, but other materials are found which are related to gum arabic, such materials as gum arabic and similar gums, whose properties and office in the animal, whose function in animal nutrition, we practically know nothing about. That is true also of certain of the nitrogenous compounds which are in cattle foods. What is the result of that ignorance? It is simply this, that in the experiment work, or even in the practical work which we try to do in animal nutrition, we are unable to interpret results because we lack in certain fundamental information. Now I believe that the province of the experiment station, the function of the experiment station, is to discover these fundamental facts that underlie the whole business of agriculture, whether they are found in plant nutrition or in animal nutrition. And it would amount to very little, in fact, it does amount to very little, for an experiment station force to busy itself in the actual affairs of practical agriculture until it can explain things which underlie agriculture; and so, as far as it is possible for us to do it, and not run too much counter to public opinion, we are using our money, as many other stations are using their money, to discover these needed truths. For instance, in the line of plant nutrition, we are carrying on some work which is now in its third or fourth year. We have said but little about it, we do not propose to say much about it until we have something to say. We know too much now that isn't so; there is too much that we are not sure of. This line of work is being conducted in the forcing house, and what is its purpose? Well, its purpose is to discover what are the different capacities of different plants for getting their food. We have in the markets to-day cheap fertilizing material which we call inert, such as ground South Carolina rock, costing only about one-third of what it will cost us when dissolved. The question has arisen, and it has been a mooted question for the last twenty-five years, what is the value of this insoluble material, this merely ground, raw material? Do the plants use it? And if any do, what plants? And so for three years we have been cultivating in a forcing house (and we erected a forcing house for that purpose alone at an expense of $2,000) several species of plants, and are studying the capacity of those plants for getting their food out of crude material. We have reached some facts; for instance, every species of plant that we have tried so far, belonging to the mustard family, the cruciferae, such as turnips, cauliflower and that class of plants, are taking the cheap phosphoric acid just as readily as they take the costly phosphoric acid that has been made soluble. We have, for instance, in one box everything the plant needs and some soluble phosphoric acid besides; we have in another box all the plant needs and the phosphoric acid in a crude form; in another box all the plant needs and phosphoric acid in another form; and in still another box all the plant needs but no phosphoric acid. We find, curiously enough, that the plants belonging to that family, such as turnips, are taking that cheap phosphoric acid as readily as the costly dissolved acid which you ordinarily put on to hoed crops. We find another interesting fact; you know that we have talked a great deal about the value of the legumes, such as beans, peas and clover; we find that that class of plants is doing pretty good work at getting this crude phosphoric acid. We have not attempted yet to explain why this is so. We believe it to be—and it is a good theory to work on until we have a better one or until we have proved it to be true or not true—because the acidity of the roots is greater than is the case with some other plants. Now we have been trying in those boxes, certain plants belonging to the grass family, such as oats, barley and timothy. Timothy turns up its nose at everything but soluble phosphoric acid, and the oats and barley do not thrive on the crude forms of phosphoric acid as they do on the soluble. And when you come to corn, that seems to be unable to do anything with the phosphoric acid that has not been prepared for it. The same is true of potatoes and tomatoes, at least in the early stages of growth. So while we have found characteristic differences we have found only two general classes of plants that appear to be using this cheap material to advantage. That illustrates to you, friends, something of what we are trying to do in studying the ways which plants have in getting their food. By and by we are going to take certain nitrogen compounds, and see whether any plants can eat leather, hoof and horn meal, and substances of that kind.

We are attempting to do something of the same kind of work in animal nutrition, and I will mention a little illustration that some of you have heard me use before. Secretary McKeen will remember that I was sharply called to account for the results of this experiment in an Institute at Madison. Two years and a half ago we sent to a dealer in Shorthorns in Maine, and purchased some grade Shorthorn steers, and we have been using those in the study of this old question of the nutritive ratio. We have had a great deal of experimenting along that line. You know we have certain teachers who tell us that it does not make any difference what kind of a ratio you feed the animal, whether you feed a good deal of protein or a little protein, whether you feed a good deal of starch or a little starch, provided you feed the animal enough, and good foods. There is another class of people who say it does make a vast difference how foods are compounded; and it occurred to me that the Maine Station might as well attack the question in a severe way as any other. And so two years ago last spring we began to feed those steers, one pair on a very narrow ration, largely linseed meal, and the other pair on a wide ration, using corn meal for a large part of it. We kept one pair growing until they were something more than a year old, and the other pair we kept growing until last month. Now we have not been satisfied in that experiment with merely weighing the steers to ascertain their growth, but we have done this most remarkable thing (it may seem so to some of you,) we have spoiled four splendid carcasses by hashing them up and making an analysis of the entire bodies of the animals. It hurt the feelings of the butcher who slaughtered the last pair, very much, to see a couple of steers weighing about 1,400 pounds each, being the very best kind of beef because they had been fed well from the first day we began to feed them, devoted to any other purpose than selling them out of his cart. He seemed to regard it as a waste of good beef. But our object in making an analysis of their bodies was not only to determine the amount of growth but the kind of growth. Has the wide ration made a fatter or a leaner animal? Has it developed, or failed to develop, this part or that part of the animal? What has been the effect on the animal? These questions could not be answered by merely looking at the animals and weighing them, but must be answered by a close study of the bodies. This is what we have done, and you can understand what an immense amount of labor has been involved in that work. That illustrates what I mean by the kind of work which an experiment station can do. There is nothing practical in that work only as it answers disputed questions.

After our Experiment Station had been inaugurated a few years, we established a Department of Horticulture, and the work in that Department has come to be quite broad. We are not only testing varieties, and breeding plants there at the College, but we are doing a good deal of work outside. We have several places in the State where, under our direction, untried and unnamed varieties of apples are being grown. We have associated ourselves with Ex-President Pope of the Pomological Society of the State, in extensive work in spraying in his orchard; and we have in several places in the State entered into co-operation with the owners of orchards in testing methods of spraying. This is a part of the work that we have done outside.

We have also a Veterinary Department that has been very quiet; but one chief reason for our being very quiet along that line is that the work that we have done has been chiefly with reference to this disease so much discussed, tuberculosis. We have a good many unpublished records of work along that line, which we are going to publish; work so extensive that in our judgment it will add materially to the knowledge now existing with regard to this disease. Let me illustrate. I needed two animals for certain experimental purposes, and I did not care especially whether they were very good ones or not, so we went outside and bought a couple of mean looking brindle cows that were in a way a sort of a disgrace to the barn, and we discovered by the injection of tuberculin that they were probably diseased. The temperature rose to the orthodox figure, 105 or 106. We saw there our opportunity to do what has been asked for in several states, namely, the repeated injection of tuberculin into those animals to see whether it would hasten the disease, whether it would injure the animals, whether it would retard the disease. We kept those cows for several months, and at short intervals the veterinarian injected them with the ordinary amount of tuberculin. After the first injection the animals failed to show any rise of temperature; a fact which had previously been noted by other veterinarians in connection with other diseased animals. But we kept giving the tuberculin, and they appeared to enjoy it. They neither stopped eating nor chewing their cuds, nor in any way showed that they were unhappy. At the end of nine months we slaughtered the animals, and had a careful post mortem examination. We found that both the animals were, as the first injection showed, diseased; but our friend, the doctor, will appreciate the statement which I am about to make; the lesions in the lungs of both animals were small and had become incisted, showing that the active development of the disease had practically ceased. Whether if the treatment had been continued longer there would have been an absorption of that tuberculous matter and the disease would have disappeared from the animals we cannot say; but certainly, while the disease had every chance to spread that it has in any animal, the injection not only failed to injure the animals but appeared to give a check to the disease. Now one swallow does not make a summer.

Ques. Were those cows giving milk?

Ans. Yes, sir. We threw the milk away.

Ques. Did the tuberculin have any effect on the quantity?

Ans. We did not see that it did. And I will say, so far as that is concerned, that we have had twenty or thirty well animals at the College, all of which have received injections of tuberculin, and we have yet to see the first case, in spite of statements made elsewhere, where the animal appeared to be disturbed in the slightest degree, except momentarily, when the syringe was punched through the skin. So that so far as our experience is concerned in the use of tuberculin we have no criticisms to make as to its effect upon the animal. We have in one case, yes, possibly in two cases, killed animals that showed the reaction that did not appear to contain any disease, but that would be a very small percentage of the cases that have come under the inspection of our veterinarian.

Doubtless all of you will recall that a year ago this winter the Congress of the United States appropriated $10,000 to be used in this country at the discretion of a special agent appointed in charge of the appropriation, in investigating questions related to the use of human foods; in other words, investigation along lines of human nutrition. Prof. Atwater was appointed special agent in charge of that appropriation, and as he was inclined to favor the members of his own family, so to speak, about one-tenth of that money was set apart to be used under the direction of the Maine Experiment Station. I thought perhaps I could, in mentioning this, speak of something that would be new to you and would interest you more than something in regard to affairs of which I have talked more in times past. In this investigation, we have been using the students of the Maine State College for a feeding experiment, with their knowledge and consent by the way, for we do not do many things without the knowledge and consent of that body of students. During the past year we have been making a study of their food consumption, and the influence upon that food consumption of the supply given. Those of you present know that milk and meat are very much alike; and you may, or may not, know that a man can purchase in milk at five cents a quart a certain amount of animal nutrition, animal food I should say, for about one-third of what he can purchase it in beefsteak. The question has been raised a great many times, "Is a supply of milk an actual saving, or does a family take its milk in addition to the food that it would take if no milk were used?" That question was raised in regard to our boarding house; can we afford to furnish to our students all the milk they will drink? By the way, our milk is inspected, no milk comes in from any animal that is not inspected. We found that if our students were allowed milk once a day they would drink about fifteen gallons, with what was cooked. If they were allowed all they would drink they drank about twenty-five gallons. The question is, was that extra ten gallons of milk economical? In order to get at that question it was necessary for us to take account of and weigh everything in the shape of raw material that went into the boarding house, and to save and weigh every particle of waste, and analyze both the income and the outgo; the difference between the two being the amount of food matter consumed by that body of eighty or ninety students. That we have done for two terms, and while the report is not written, I know enough of the figures to know that the actual cost of the food consumed by that body of students when they were consuming twenty-five gallons of milk, was materially less than when they were taking a larger part of other food. At the same time they have consumed as much food when taking the milk, and practically no more; I mean as many pounds of food nutrients. We find that the food consumed per person, per day, in pounds or ounces, is about the same when they drink the milk in larger quantities, as when they drink the milk in smaller quantities; and the milk being cheaper, made the food cheaper. You may say that this work is not strictly agricultural, and it is not. But it is not supported out of the funds coming to the Experiment Station. I have an extra chemist doing that work, and it is under my own and his supervision; and while it is not strictly agricultural it deals with great economic questions, the economic feeding of the human body. Next term we are not going into this dietary question but are going to use the money to study the influence of the digestibility of certain foods. I want to say to the ladies present that there is no practice that is looser to-day in its actual methods and principles than the practice of cooking, and about which we have so little actual well-defined knowledge.

Report of the executive committee.

GENTLEMEN OF THE BOARD: In making our report as executive committee of this Board we will first present to you the report of the committee on legislation which has been made to us and is as follows:

AUGUSTA, January 22, 1895.

The committee on legislation met at the rooms of the Board and proceeded to the consideration of the business assigned it. The first business was the drafting of an amendment to section three of chapter 297 of the Laws of 1885 relating to the sale of unwholesome foods; we made amendments as to the color of any foreign substance made in imitation of butter, and compensation to complainants.

An amendment to section eleven of chapter 186 relating to State aid to agricultural societies.

We prepared a resolve in favor of printing 12,000 reports of the Secretary of the Board, all to be bound in cloth. Also a resolve in favor of an appropriation of $1,000 for salary of the clerk in the Agricultural Department.

We consulted with the members of the committee on agriculture of the legislature, regarding all these matters, and have their approval and believe we have put them in such form that they will be in accord with the views of this Board.

Respectfully submitted,

W. H. MOODY,
F. H. MOOERS,
T. E. SKOLFIELD,
Committee on Legislation.

The only regular meeting of the executive committee for the year was held at the Bangor House at eight o'clock P. M., on June 4th. No formal votes were taken, but suggestions were offered in relation to a Field meeting of the Board sometime in August, at some point in the western part of the State, probably at Old Orchard. This meeting to take the place of Institutes for that section. The matter was left with Mr. Vinton of Cumberland who was to correspond with Mr. Straw of York, and report conclusions as early as possible.

Respectfully submitted,

L. G. SMITH,
W. H. VINTON,
B. F. BRIGGS,
Executive Committee.

Mr. VINTON—Two or three things are suggested in the report of the Secretary which we want to consider. One of them is whether it is desirable to hold a Field meeting. My first idea in regard to a meeting of that kind I got from the agricultural report of New Hampshire of last year, which contained a lengthy and admirable account of the Field meeting which they held and of the papers which were read. I said if we can have such a meeting as that with such papers, I believe it will do us very much good. Whether it is advisable for us to have such a meeting we will consider.

Another thing which I think we want to look at a little, is the meaning of the term "Gratuities." Our State stipend is now based upon premiums and gratuities. Of course it is easy enough to understand what a premium is, but what is a gratuity as that term appears in the law, and as a basis on which the stipend is awarded?

Also I am thoroughly convinced that the time has come when this Board should consider its connection with the Maine Pomological Society. I think this is a matter upon which we should have some understanding. We have drifted along in some way with a connection with the Pomological Society and we hold an annual meeting in conjunction with them. You will see by the Secretary's report that this Board of Agriculture out of its appropriation, the appropriation made by the legislature for carrying on the work of this Board, to a certain extent pays the expenses of this winter meeting with the Pomological Society. I do not know how this custom sprang up, probably it is all well enough; but doubtless this was originated when the Pomological Society was very much weaker than it is now. And when it is considered that in our own legitimate Institute work, for which the money of the State is appropriated, the whole subject of orcharding and fruit growing is taken up, a portion of that work being strictly pomological work, it is a question of some importance whether it is advisable for us to continue further any connection with the Pomological Society. Or if we are to go on as we are now, how much of the expenses of the Pomological Society shall come out of the appropriation which we have for the work of the Board, I should think would be a matter that would come up for consideration.

Mr. SKOLFIELD—Can the Secretary tell us just about how much is appropriated annually, and how much has been actually spent during the last year for Institute work?

Mr. MCKEEN—The State appropriates annually $3,000 for Institute work, $300 for the expenses of the Secretary and $400 for the expenses of this meeting. Beside this there is, of course, the appropriation for agricultural societies, and for the salaries of the Secretary and clerk. This appropriation of $400 can be used at no other time except for the annual meeting of the Board at this place. During the last year nineteen hundred odd dollars has been spent for Institute work, and the remaining eleven hundred has been spent for various purposes, a part for the Pomological Society, a part for the dairy meeting, a part for the Field day at Orono, etc. You will notice that this year has been a very expensive year for outside work. I paid Mr. Spear for counsel $100; and Wallace Weeks for services $108, every cent of which he earned, but which I hope will never have to be paid again. Also the expenses of the legislative committee had to be paid. I had no other way of paying these bills except taking it out of the appropriation for Institute work, and this was done with the advice and consent of the executive committee. We have held during the year forty-six Institutes.

Ques. In closing up the year how do you stand with the State on the $3,000?

Ans. With the exception of a few bills which have not been secured we are square with the appropriation for 1895. These bills with the expenses of the Joint Winter Meeting and the Institutes held since January 1st, will come out of the appropriation for 1896. You understand that it is necessary for us to draw all of the money appropriated for 1895 before January 1st, 1896. But sixty cents of our appropriation went back into the treasury.

Ques. Was not the Pomological Society granted a larger amount of money by the last legislature than it had ever had before?

Mr. McKEEN—By the last legislature but one; but through a misunderstanding, which largely arose in this office, they did not get it until the last legislature. I supposed that the Pomological Society drew its money independently, and did not include that $500 in my estimation for agricultural purposes. The law was all right, but when we came around to it there was no money, and they could only get their $500. At the last legislature an act was put in which gave them that $1,000, for the two years preceding, and an appropriation was added so that they now get $1,000; but that can only be drawn by vouchers from this Board.

Mr. VINTON—Why should the Pomological Society be subjected to that?

Mr. McKEEN—I do not understand it at all; I only know that this is included in our appropriations, whereas the money for the agricultural societies is not included. In regard to our connection with that society, all I can tell you about it is to read from the statutes, section two, page eighteen. "The Board by its Secretary and one of its members shall hold annually two Farmers' Institutes in each county, and as many more as it deems expedient or finds practicable with the means at its disposal, for the public discussion of topics relating to husbandry, either independently or in connection with any organization devoted to the same general object."

I presume it was from that last clause that the plan originated. I found that it had been a rule between the Secretary of the Board and the Secretary of the Pomological Society to hold a Joint Winter

Meeting, and recognizing the efficient work that that society had done, and that it had been cramped for means, I continued the practice of my predecessor. Now that they are getting $1,000 the matter has been talked over, and I made this suggestion to the secretary of the Pomological Society, that as far as I was personally concerned, if he would feel to put double the money into this meeting I would still continue putting in this amount so that the work of the society might be doubled, they putting in as much as the Board. For instance, you understand that the meeting at Presque Isle cost us about $200. Now if the fruit industry will warrant holding a meeting that will cost twice as much, I will continue putting in the same amount with the understanding that the Pomological Society will add at least as much.

Mr. WHEELER—I am interested in this matter, being a member of that society and a member of this Board. When I became interested with that society, as Secretary McKeen has stated, your Secretary helped bear the expenses of the Winter Meeting, and has continued to do this since the larger appropriation has been granted to our society. I do not want to take up too much time, but in order to explain this matter to you in full I would need to go back a little and state some facts to you. When the society was organized one of its by-laws was that whoever joined the society as a life member should pay ten dollars, and the money so paid should constitute a permanent fund. This has amounted at the present time to $1250. The early officers of the society were cramped for means, and they used at different times a part of that permanent fund; they could not pay their bills without using it. They kept an account with the fund, and at one time I think they were in debt to it six or seven hundred dollars. They were all the time trying to do good and efficient work, under the best men, perhaps, in the State, as executive committee. From time to time we have tried to pay up that debt, and to-day, with the larger appropriation, it is nearly paid; yet with the increased demand which the fruit-growing interest has made on us throughout the State, it is hard work to close that matter up, even with the appropriation we have. We receive from the Maine State Agricultural Society $500, and in lieu of that we pay all the premiums and the running expenses, if I understand it rightly, of the Pomological Department in the upper part of the exhibition hall, at the State Fair. There may be some incidentals, such as repairs, that the Agricultural Society pays, but the expenses of running that exhibition we pay wholly. Last fall the premiums amounted to between eight and nine hundred dollars, and the expenses of the Secretary and executive committee and hired help amounted to perhaps $250 more. Our money has been spent in that way, and in holding this Union Meeting with your Board. It has always been pleasant, as far as I know, for the executive committee of that society to have your support. We have felt that we could claim some support from the

Board, as perhaps the dairy interest of this State might call for help from you; that pomology was a part of agriculture; that it was something that was worthy of your support. You have helped us in the past and we are thankful for it, and we would be glad to swim together still longer.

Mr. VINTON—Let me inquire what part of the expenses of the Joint Winter Meeting are paid by the Secretary of the Board.

Mr. MCKEEN—We pay for the expenses of all the speakers, and the expense of the hall, when there is any expense. At Presque Isle the hall was paid for by contributions from the people in the town. The Pomological Society pays the expenses of their officers present at the meeting, and the premiums on fruit.

Mr. VINTON—The custom has been that all the representation this Board shall have at the Joint Winter Meeting is the Secretary. Sometimes certain members of the Board come forward and express a great desire to attend. This year I said I wanted to go down to Aroostook county, and of course I always want to attend the meeting of the Pomological Society; so I said that if I could go without any injury to other members who have the same right, and without injuring our fund, I would like to go. Now this desire that I had, of course operates with every member of this Board, and yet we cannot all attend on account of the expense. Now how far we are authorized to pay the expense of their speakers, especially if it works to the prejudice of paying our own men who want to attend, is something of a question.

Mr. MOODY—If I have any faults, which is very doubtful, the greatest one is that I generally tell what I think, and tell it about as soon as I think it. If I am with you you know it; and if I am against you, you know it. I have been asking a few questions and listening to what has been said in order that I might get a clear understanding of the matter. I want to tell you how I view it, so that you can see whether I have a clear idea or not. It seems to me that at some time we established a custom of paying the expenses of speakers for the Winter Meeting of the Pomological Society. At that time this Pomological Society was receiving $500 from the State, but the appropriation has been increased by the State to $1000. They established a permanent fund away back somewhere, in their wisdom, and at some times when they were short of funds they were obliged to draw on that fund. And now it amounts to this, the money that we have given them they have taken to pay their debt; perhaps not the very same money, but it amounts to that. The debt is nearly paid, and they have a fund of $1200, I suppose from which to draw the interest. Now we have no permanent fund at all, and we are short of funds. There is an inquiry every little while of me, "Can't we have an Institute?" The farmers in our county are so interested in these matters that they want Institutes. I say to them, "These Institutes are limited by money, but we will do the best we can." I will not say that my mind is really made up but it seems to me a question whether we ought in justice to ourselves to continue paying this money to the Pomological Society. They have a permanent fund of their own, and if they should use that they would be no worse off than we are. It is not customary among these societies, that I know of, to have a permanent fund from which to draw interest, although it would be a very good thing. It looks very doubtful to me whether we can afford to put out this money from year to year which we need very much ourselves, to help them, when they have a permanent fund and a $1,000 appropriation. I do not wish to be understood as saying one word against the society, because I have as much interest in it as in any agricultural society, but it looks to me as though they were as well supplied as we, under the circumstances. They do not try to do the work that we do. That is the way I look at it, and if any member has anything to say that will give any more light I shall be glad to hear it, and change my mind if it is right to do so.

Mr. VINTON—I understand it that as the result of a misunderstanding the Pomological Society lost their $500 for that one year, but the next legislature made it up to them, so that they have it all right now.

Mr. WHEELER—Just a word in regard to that. We last year drew from the treasury of this State $2,000, but mind you when we started in two years ago we expected to draw $1,000 and we drew but $500 from some omission; and our executive committee came here and saw the Governor and Council and talked the matter over. And as they were with us, the committee went home and said, "We will go right ahead with our work as we planned it." They increased the premiums and did more work than previously, and hired $700 from the bank to pay those bills. You will see by the treasurer's report, which probably was printed in many of the newspapers last week, that that $700 was paid last year out of the $2,000 that the State paid us. We were really paying up old bills for work that we tried to do conscientiously.

One matter came to my mind, can the Secretary tell us anywhere near the amount of work that has been done in the line of pomology in the way of Institute work? I suppose you have had at different Institutes different speakers upon the subject, but perhaps it would be difficult to sift it out.

Mr. McKEEN—We could, of course, follow it out by looking through the records of our meetings, but I doubt if it is wise to do that now. In quite a good many of our Institutes we have had a speaker on pomological subjects; I should say more than half of them.

Mr. MOODY—In order to bring this discussion to a point I will make a motion that the Board cease paying the expenses of speakers for the Joint Winter Meeting with the Pomological Society.

Mr. WHEELER—I am glad that this subject came up thus early, as if you want to sever the connection and not help the society in the payment of its winter bills we want to understand it so that we can cut our garment according to the cloth. We want to do all the work we can in the interests of pomology, but if you are not to help us we must understand it so that our executive committee can make arrangements accordingly.

Mr. FLINT—The question occurs to me whether if the Board intends to do any work in the line of pomology we can do it better independently, or whether we can do it better through that society. If the pomological interest needs any help from us in the State at all cannot we do the work better in connection with that society than to take out the money and do it independently. I bring this up because, if we do intend to aid the fruit-growing industry of the State, why not apportion a certain amount to the assistance of the society at their discretion? It looks reasonable and businesslike to me, because otherwise it looks as though we were going to drop the subject entirely and devote our attention to some other branch of Maine industry connected with agriculture. It seems to me that it would not be as well to split up and have two branches of this work as to keep it under one head. This is just a thought for consideration.

Mr. MOODY—It is split up now. We are looking all the time for pomology. Brother McKeen says that in over half of the institutes he has had a pomological speaker. We have not split up, or changed our position. The question is whether we shall pay part of the bills of the Winter Meeting, or save the money to pay our bills.

Mr. WINSLOW—It seems to me as though this branch of the agriculture of the State is having as much attention paid to it by the Board as any other branch; and then here is a separate organization with appropriations. There are other branches that might form societies and ask for appropriations. Is not the dairy interest of as much value as any interest, and might not that call for an appropriation and a separate organization as well? The Board, as I understand it, is at work for agriculture as a whole, and if there is a locality where the people want talk on pomology we get speakers to go to that section and talk to the people on that subject, expending the Institute money for the purpose of promoting pomology. And we may have another speaker on dairying, if that hits the people as well. To bring this discussion to a close I will second the motion of Brother Moody.

Mr. FLINT—It would seem, as we do not know what the Pomological Society intends to do for the next year, and as they do not know what they can do unless they know how much the Secretary can do through the Board, as if the question had better be left with the executive committee, to assist as best they can the Pomological Society; then, as the Board knows what they are doing in this line and should know through the Executive Board of the Pomological Society what that society is doing, they will not work the same ground, but each will know what ground they can work.

Mr. MOODY—I have been a member of the Board for three years, and I have always noticed that we are apt to refer these questions to some other authority, and that relieves us of the responsibility. Now there are fifteen or sixteen of us here and I think it will be better for us to meet the question now. We can all express our views by voting upon it, and I think that is the proper thing to do.

Mr. STRAW—I have listened to this discussion with a great deal of interest, and I have learned quite a good many things concerning the societies and their relation to each other. They seem to me something like a parent and a child, and the thought came to me whether under the circumstances, with the present amount appropriated for each, the child would not gain strength faster by being let loose to go alone. Will not the Pomological Society take more interest in the work if they know that they are a separate organization? Will it not be better for both societies in the end, for each to go his way? Do we not lose sight of the fact that the Board of Agriculture is interested in pomology? It seems to me that when we select a man to lecture to us on orcharding, that is one part of the pomological work. At very many of the Institutes we have lectures on pomological subjects. I, for one, am in favor of the motion. We have no more money in this Department than we need, and I think the money appropriated for the Pomological Society would be used as judiciously if they were to handle it themselves, select their own speakers and steer their own canoe. Of course the cordial feeling existing between the two societies would be the same; we would simply withdraw our funds and sever our connection with the society to that extent.

Mr. LIGHT—As I understand it from the discussion, there is annually appropriated by the State a certain amount of money for Institute work, a certain portion of which has been used to aid the Pomological Society. If this is correct, would it be any different if some other State Association should ask for aid from the Institute funds? Supposing there were a State Dairyman's Association or a State Wool Growers Association, and at some State meeting like the Annual Winter Meeting of the Pomological Society, they should call for certain aid, would the cases be dissimilar? If the Board goes on in this way there might in the future be other calls similar to what I have suggested; and while I know the State Board is favorable to the promotion of all pomological subjects, still is it quite right for us to continue aiding that society in the manner in which we are aiding it? I am not quite clear about this, and I move that the matter be laid on the table until to-morrow morning at 9 o'clock.

This motion passed.

Mr. LIGHT—Two other subjects have been alluded to, but nothing definite has been done in regard to them; and I am going to offer two resolutions and move that they lay upon the table until to-morrow forenoon. One is a resolution relating to cream.

Resolved, That it is the sense of this Board that a legal standard of measure for cream should be established that shall be based upon the weight of butter fat it contains, determined by scales and the Babcock test.

The other resolution relates to seeds and is as follows:

Resolved, That this Board use its influence to secure the passage of a law to establish a standard of purity of grain and grass seeds imported for sale, and providing for inspection of the same.

Voted that these resolutions be laid on the table.

On motion of T. E. Skolfield adjourned until 9 o'clock Thursday morning.

THURSDAY A. M.

Records of Wednesday's meeting read by the Secretary.

On motion of Mr. Flint voted, that the business laid on the table in the Wednesday P. M. session be now taken up. The first business was the motion of Mr. Moody that the Board cease paying the expenses of speakers for the Joint Winter Meeting with the Pomological Society.

Mr. Light—I did not understand clearly the relation of this Pomological Society to the Board last night, and I wished to understand it better and have taken some pains to investigate the matter. I find that in 1873 the State Pomological Society was incorporated, and in 1893 the laws were amended so that said society "shall have all the rights, privileges and powers conferred by the laws of this State upon county and local agricultural societies," placing it upon about the same basis as our county agricultural societies, also it "Shall be subject to all liabilities imposed by existing laws upon such societies so far as the same are applicable to members of this society; but the bounty to be paid by the State to said society shall not exceed the sum of $1,000 annually." There is appropriated from the State treasury annually a sum of money for the agricultural societies, to be divided according to the amount of premiums and gratuities awarded by said societies; it is an indefinite sum; while the Pomological Society has a definite annual appropriation of $1,000. In all other respects the Pomological Society is placed upon the same footing as the agricultural societies. We have also a provision that the Board by its Secretary shall annually hold two farmers' Institutes, or more, in each county, and the expense, under this section, shall not exceed $3,000 annually. Now in addition to the expense of holding these Institutes the Board may "Issue bulletins, employ experts, lecturers, a reporter or other aids" and reimburse the members for their expenses and travel; and all this is to be taken out of the $3,000 appropriation. The Pomological Society receives $1,000 annually, and in addition to that, out of this sum of $3,000 it has been receiving something to aid in holding its Winter Meeting. For the year 1895 the resources of the Pomological Society were $1,721, and in addition to that they received $200 from this Institute fund. They expended in premiums, $869.85. Now it seems to me that the Pomological Society is very amply provided for; and if there is any fund that is drawn upon heavily it is the Farmers' Institute fund. The Secretary reported 46 Institutes held during the year at a total cost of $1984.89, average cost, $43.16. At many of these Institutes, as you all know, the subject of fruit in its various branches, received careful consideration. It seems to me that one of two things should be done; we should withhold this aid from the Farmers' Institute fund, or else we should hereafter at our Farmers' Institutes take no consideration whatever of fruit or pomology. I am in favor of the motion of Brother Moody.

The motion was then adopted.

Mr. VINTON—In adopting this motion of course the Pomological Society and its officers will understand that we do not mean (in the phrase that was used yesterday) to sever our connection with that society. We want to continue to work with them. We have simply come to the conclusion that they are as well able to pay their lecturers at the Annual Meeting as we are, and have voted accordingly.

The resolutions presented by Mr. Light Wednesday P. M. were now taken up and on motion by Mr. Light voted, that they be again laid on the table, in order that the Board might proceed to carry out the regular programme.

The Committee on Pay Roll presented its report, which was accepted with an amendment providing that the $5.00 apportioned to the President be given to the stenographer.

Discussion opened by Mr. Flint of Somerset. Mr. PRESIDENT: I have selected a matter from the report of the Secretary to speak upon, for a few moments only, as I am aware that the time is worth something and I prefer to hear from others on this subject. While we are sensible of the advantage of scientific research, there are very many farmers who do not have that faith in what we term science that they should. This is a subject upon which volumes might be written but I will say only a few words upon it at the present time. The Secretary mentioned among other things, that the object of the Board was to advance science as applied to agriculture. And it is expected of this Board that it shall reflect all the advanced ideas upon agriculture, and have them circulated among the people. Therefore we, as a Board, need the instruction which we are receiving. But are we aware that the people of this State at large are ignorant of the doings of the Board of Agriculture? I have been surprised to find, while traveling among them that they do not even know that there are reports published of the doings of the Board, and books containing advanced theories as put forth by our Board and the Director of the Experiment Station. We need to labor in this direction, not only that we may bring ourselves up to the level of many who surround us, but that we may be able to compete the better with every part of the world, which is advancing equally with ourselves.

There is no doubt but that the question of reducing the cost of production is the leading question of the day. If the West can produce cheaper than we can they are going to take the markets of the world from us. If we can compete with them in production we can hold our own markets. The question is broad because it takes in the whole field of agriculture and science. It takes in the entire field of invention, and the ability of the farmer to adapt himself to his circumstances and surroundings. Consequently, while the relation of the experiment station to the farmers is of very great importance, it is nothing like the importance of the relation of the farmer to the experiment station. And this is where the labor of the Board comes in. We have reason to thank our Secretary for the effort he has made to bring prominently before the people of the State the labors of the Board and the advantages of the Board to the people. We hope to be able to do better work in the future, because the tendency is constantly progressive, and it behooves us as people of Maine to keep up with the procession.

On motion of Mr. Light voted, that the first resolution be taken from the table.

MR. LIGHT.

Mr. PRESIDENT, GENTLEMEN OF THE BOARD: This matter relating to cream is one that it seems to me might be considered profitably. Cream has become in recent years one of the larger products of the farm in the State of Maine, and its production is increasing very rapidly, as you are all aware. It has been handled under quite a variety of methods, and it seems to me that some uniform method would be desirable. Cream formerly was measured by the inch; then a change was made to the space, then to the gallon, and now it is sold by weight to a considerable extent. It seems to me that if some uniformity could be obtained it would be better. Cream is not recognized on the statutes anywhere. It has no standard of measure, notwithstanding it has become such an important product. Many other products in Maine have some legal standard. And while I am not in favor of any law that would compel everybody to buy and sell by the provisions of that law, yet I would like to see some law by which cream could be handled in a legal manner; a law that would be so simple and so satisfactory that the tendency would be towards it, so that it might become universally adopted. I do not know that anything that is embodied in this resolution would lead to that, but I have introduced the resolution in order that it might lead to something profitable. The question has been raised whether such a law could be enacted; but we have in the statutes, laws establishing the standard of a bushel of potatoes, a bushel of grain, etc. We have also a law relating to milk, but there is nothing that applies to cream. Now there is a great variation in the value of a gallon of cream. As cream is being sold in the State of Maine to-day, it is testing all the way from eight per cent to sixty per cent in butter fat. Now I have computed what variation there might be in a gallon of cream. I will say that there are only two elements in a gallon of cream that are of practical value, the butter fat and the buttermilk. Now take a gallon of cream that will test ten per cent, and the butter fat is worth, assuming a price of twenty cents a pound, seventeen cents. Take a gallon of cream that tests thirty per cent and at the same price the butter fat would be worth fifty-one cents. There is a variation of thirty-four cents. The buttermilk in the gallon of cream containing thirty per cent butter fat might be worth a little less than in the gallon containing ten per cent, but it would probably not be more than one cent. But in the butter fat there is a wide variation. I might have taken eight per cent and sixty per cent, and you see there would be a wider variation still. This butter fat is the principal element of value in cream. It produces creamery butter; and butter is always sold by the pound not by the gallon or by the space. Now why cannot that cream be estimated by weight instead of by measure, and the estimate be based upon its most important element, the butter fat? Therefore have a legal standard, that cream shall be valued by its content of butter fat determined by the scales and by the Babcock test. I mentioned the Babcock test, but I am not particular about that; Prof. Jordan thought the gravimetric test might be better. The Babcock test is used principally in the State of Maine, in determining the butter fat content of cream, and it has some standing in the State by reason of the statute enacted last winter, whereby the bottles shall be legally tested and the person who manipulates the test shall be certified that he is qualified to manipulate it. As far as I understand the subject I feel as though some legal standard, basing the value of cream upon the butter fat which it contains, determined by weight and the Babcock test, would be a means of introducing more uniformity of method. Another thing, suppose a case of litigation should arise, suppose a farmer has not been paid for one or two months cream and wants to recover that money, how could the amount due him be reasonably determined except by the butter fat which the cream contained?

I began my creamery business by buying cream by the inch; I next adopted the Babcock test, then the space pail, continuing the Babcock test; and now I buy cream by weight, still using the Babcock test. The cream is estimated on the butter fat content, and this is far the most satisfactory method that I have ever practiced or that I am familiar with.

Mr. VINTON—A suggestion has come to my mind that I think it worth while to mention. We will all admit that when the Board of Agriculture, representing the agricultural interests of the State, goes to the legislature and asks for the enactment of any law we ought to be very careful to know that the law is practicable, for that is really the basis of wise legislation. I have noticed that when we go to the legislature and ask to have a law enacted, especially if they do not want it, they will say, "That is not practicable; that will not work." But when we have a precedent established on the statute books we can say, "This, is as practicable as that, and that has been there a long time." The statute books are full of legislation upon this very matter of providing legal standards of weights and measures, as in the case of a bushel of oats, peas, etc. The statute with the most minute provisions that occurs to my mind is one in regard to lime. You will pardon me if I read it. (Section read.)

On motion of Mr. Flint voted that the resolution be adopted.

On motion of Mr. Light voted that the second resolution be now taken up.

MR. LIGHT.

MR. PRESIDENT: I feel as though I had already complied with the part of the programme that was assigned me, and I would like to leave this matter for others to discuss. But I will say what my idea was in offering this resolution. I have noticed in my vicinity for two or three seasons that a great many foreign weeds are being introduced. The custom of buying western oats prevails there extensively, (I think they come from Chicago) and this past season an immense amount of charlock was the result of the sowing of those oats. Then weeds are introduced in other ways, and it seems to me that here is a danger that ought to be avoided; but I do not feel very clear as to how that can be done. One of the ways of avoiding it is by being more careful in the selection of our seeds. Our Secretary has mentioned the matter twice in his annual report, and at our Institutes in Knox county last fall I requested that Prof. Harvey should speak upon harmful weeds, and he gave us very instructive and interesting lectures. I feel as though the dealers were not criminal in this matter. They do not mean to introduce foul seeds, perhaps, but are careless about it, and the farmers are ignorant of the results that may follow. I do not think that we can get absolute purity, but I think we might get grass seed that is comparatively pure. What I meant by a standard of purity was that seed containing on being tested, say more than five per cent of foreign weed seeds or weed seeds of any kind, should be considered impure seed. Put it at any per cent you like, only establish some standard of purity, so that if the seed goes below that, it will be considered adulterated seed. And then make some more ample provision for its inspection. We can send seed to the Experiment Station, as I understand it, and they will analyze it free of cost. Perhaps something compulsory upon dealers in seeds, like the law in regard to inspection of fertilizers, might be obtained.

MR. FLINT—There is a difficulty in the way. The most of the seed used in New England is Canadian seed, brought from western and north-western Canada. We cannot control that, we have nothing to do with it until it reaches us; we must either take it as we can get it, or establish an expensive system of examination and repacking.

Our statute books are loaded now with laws and it is pretty hard to awaken the legislature in this matter of seed purifying.

We can get pure seed through our seed stores by paying a good price for it. Most of them advertise pure seed, and most of the seed catalogues advertise pure seed at a good price. There are some things that we have to live down.

"Since life is oft perplexing, it is the wisest plan
To bear our trials bravely and smile when'er we can."

Mr. WHEELER—This matter has been brought to my notice, of late, by persons in my own county, and they have asked me to bring it before the Board with reference to having a law passed something as this resolution calls for. And yet, in consideration of the matter, what can be done? By every roadside we find the seed scattered and the plant growing, and still scattering more seed. Upon every farm you will find a multitude of seeds, or flowers from weeds. What can we do to suppress this evil? During the past few years the greatest amount of trouble has come to us in Franklin county from what we call wild turnip. In all the fields, you will find it scattered freely. And the question has come to me, how did it come to us? Has it come from the purchase of western seed oats, or has it come to us in our clover seed? Is there any way in the future, to keep from getting more of this seed and is there any way to prevent the farmers from sowing the seed as they raise it in their grain? I have seen, even on my own farm, quantities of this wild turnip seed sifted out from the threshing machine. This fall was the first season that we have threshed the grain for a number of years. I did what I could to get rid of the wild turnip seed, but I know that the barn floor was full of it. What can be done?

Mr. DUDLEY—In regard to the seed business, I think that the farmers themselves are much more to blame than the seed men. I know there are concerns in this country who sell what they call a recleaned seed, that is, clover and herdsgrass seed. I have examined quite a lot of it and I think it is very pure as a general thing. Seed of that quality would cost us somewhere about two cents more a pound than the other seed, and some dealers will get the cheap seed, sometimes adulterated with other seeds of about the same size, selling it at a lower price. Farmers will look the seed over and say, "This seed costs less than the other and I think I will take my chances" and they will buy the cheap seed. As far as the wild turnip seed is concerned, I do not think that it could be brought in the grass seeds at all. It is very easily separated. In cleansing the seeds of clover or herdsgrass the wild turnip would all come out. There would not be one chance in a thousand that any of it would remain. But if it were not recleaned the grass seed might contain other smaller seeds. The men who handle this recleaned seed warrant it to be pure, or nearly so, and I think if we should use this seed there would be no trouble. I have had quite an experience in this seed business. I have raised a good many tons of clover seed and herdsgrass seed, and I know that unless proper care is taken you can leave a great many different kinds of seeds in clover seed, and the common farmer would be blinded and think it pretty good seed. I think the matter could be reached in some way so that we could get rid of this foul seed.

Mr. HUNTON—Quite a portion of our clover seed in Kennebec county comes from Northern New York, and as I spent quite a portion of my life there, perhaps I could answer one point that Brother Dudley raised in regard to getting wild turnip seed in the clover seed. They raise quantities of clover seed on their run out lands and ship it to us, and I have learned this; if that clover seed stands a certain length of time and ripens so that it will hull easily, the turnip seed will have matured and dropped out. But they have a way of cutting it perhaps ten days or two weeks before they ought to, and then with their machines extracting the seed, and we get two evils, we get all of the turnip seed and all of the immature clover seed. I asked some of the farmers why they were doing this, and they said, "We get all the turnip seed and all the immature clover seed and it sells for just as much a pound." That gave me a great deal of light in regard to my grass seed here in Maine. I think it is hard work to determine the clover seed, especially the immature seed, from the turnip seed.

Mr. MCKEEN—There are two species of weed known as the wild mustard. They are of the same family and differ but little in their methods of growth. The turnip has a dark, brilliant, yellow blossom, but the charlock, or the weed Mr. Dudley refers to, has a lighter yellow blossom. The pod of the turnip is like the pod of the mustard. This seed comes generally in clover. The charlock is another weed of the same family and as difficult to control. It is familiarly known as the turnip. The pod, instead of shelling like a pea pod or a mustard pod breaks into sections, each section being about the length of a barley or oat seed. Each one of these sections contains a seed. We get that weed seed in our oats and barley and other grain that we buy from the West. So you see the difficulty is multiplied as we look into this matter, and the dangers are so great that I believe it is worthy of the time and attention of the Board to look into the matter and see if we cannot get at some means by which to control it, if it is nothing more than enlightening the farmers as to where they can get proper seed.

There need be no misunderstanding as to these two seeds, one coming in Hungarian and clover and being difficult to detect; and the other coming in oats and western grains. Another difficulty in connection with western oats is that the weed seed grows after the oats have been eaten, and it is necessary not only to cleanse what you sow, but to cleanse or grind what you feed.

Mr. STRAW—As this discussion continues it seems to me we see more and more of the iniquity of mankind. I mean to say this; our seed furnishers take all the advantages in the world. According to Brother Hunton they have no conscientious scruples in forwarding any kind of seed to us, it matters not whether we are benefited by it or not. Their object is simply to get the most money out of it. It looks to me as though this might be regulated as we regulate the phosphate business. Let whatever firm furnishes seed to us in Maine send samples of their seed for investigation, and the expense would be trivial. We all have had more or less experience with these wild seeds, and it seems to be a growing evil. In my opinion this is one of the most important questions that have come before the Board, and certainly something should be done to regulate this matter. It is encroaching upon us from East to West and from North to South, and I see no reason why this resolution should not be adopted.

On motion of Mr. Straw voted to adopt the resolution.

Mr. VINTON—Last year an important law was passed by which the stipend should be apportioned upon premiums and gratuities. Now this term gratuity is used in the law, and the question comes, what is a gratuity? The Secretary in apportioning the stipend among these societies looks over the returns and finds that one society has returned such a thing, as a gratuity, and another, such a thing. The question is, What is a fair construction of the term as it appears on the statutes? I am confronted with this question in my own society as there are two views in regard to the meaning of the word.

When the committee to award premiums have exhausted all the premiums, and then come across an article in the same line that is really meritorious they want to do something in regard to it, and they put down a gratuity of fifty cents or a dollar. There is no question about that use of the term, that is all right. But, for instance, in holding our fair this year some valuable assistance was rendered by three or four women. They took a great deal of pains in fixing up the hall, got a lot of paintings, pictures, etc., and then came to me and said, "Now we want some flowers to put into the hall." I told them they should have them, and I went to the florist and told him we wanted a good display, and asked him if he would furnish the flowers. "Oh, yes! What are your premiums?" We had offered small premiums for cut flowers, and I told him what they were. "But" I said, "If you come with your exhibition of flowers and compete you will take every premium as sure as the world, and here is a woman who has a little bunch of nice cut flowers, and she will be out in the cold. At what price will you make in our hall such an exhibition of flowers as I have indicated?" He said, "I will do it for $10," and I told him to put them there. Was that $10 a gratuity? When the stipend was apportioned should we have received a pittance for that?

Take another illustration; I suppose that no one of you would think of running a fair without a band. We have to pay from fifty to one hundred dollars for a band to furnish music. We will all agree that there is no society in Maine that would think of running a fair, and running it successfully, unless they paid out more or less money for the simple purpose of entertaining the people. There must be something going on before the grand stand to take up their attention. We put in a certain amount of money legitimately and properly, for the benefit of the fair, and should not this be considered a gratuity?

Mr. McKEEN—I will refer to my own society, as I know more about that than any other. We will take, for instance, the matter of herds. We offered a premium amounting to twenty dollars for the best herd of miscellaneous cattle. That amount of money is awarded in three premiums. There may be a fourth herd that is very worthy and the committee will say, "We recommend a gratuity to this fourth herd," and the society will vote on it. That is what I understand by a gratuity. We have specimens like honey, syrup, jellies, etc., for which no premiums are named. The sum of twenty dollars is awarded at the discretion of the committee, on one class, thirty dollars on another, etc. The committee apportions this money in the form of gratuities. I understand by a gratuity, a sum of money that is paid for worthy objects that do not properly come under the head of premiums in the classes in which they are exhibited. I will call your attention for just a moment to the wording of the statute as it is at present. (Section read.) You see that while a gratuity is not defined, it does say that the stipend shall be apportioned on the premiums and gratuities awarded by said societies, provided the amount shall be based entirely upon premiums and gratuities awarded on exhibition stocks and products.

Mr. BRIGGS—It seems to me that paying a band is simply paying the expenses of running the society.

Mr. WINSLOW—In our society the trustees sometimes, instead of offering premiums will assign to the committee a certain amount of money to be given as gratuities for a special exhibit, perhaps a small exhibit of ladies' work in the hall. They will assign twenty or twenty-five dollars to be given as gratuities at the discretion of the committee. This is really a premium on that class, although it is not offered exactly as a premium, but the committee use their judgment in distributing the money. That is what I understand to be a gratuity.

Mr. VINTON—Let me give you another illustration. Some societies have a rule that they will pay exhibitors of stock, mileage upon their stock if they live, say six or eight miles away from the fair. A man who is within two miles of the fair can get his stock there so much easier than a man who is perhaps twenty miles away. One society has reported $167 paid for mileage. That certainly is not a premium; is it a gratuity?

Mr. MOODY—I do not think that is within the meaning of the word in the statutes.

Mr. STRAW—The question before us a moment ago was left in a rather unsatisfactory way, it seems to me. I therefore move you that the executive committee of this Board be instructed to appear before the Committee on Agriculture at the next session of the legislature, asking that some action be taken on this resolution.

Mr. HUNTON—I would like to ask Brother Straw to amend that motion so as to include both resolutions. It seems to me that the resolution relating to cream is equally important to the farmers. They are getting waked up over this cream business. The farmer sells his cream and he has nothing to say about it because he has no standard to work from. He cannot tell how much the creamery man owes him. It seems to me that as we have adopted this resolution, the farmers will say that the Board is thinking of this matter and will begin to look for some action in relation to it.

Mr. LIGHT—The idea in regard to the motion of Brother Straw is this; the Board has adopted those resolutions, but if we take no further action in regard to them we may lose sight of them. If his motion prevails the matter is left in a condition to be noticed hereafter. The legislature will meet on the first Wednesday in January, and about two weeks later the Board meets. It is immaterial whether it is this executive committee or the succeeding one that attends to the matter, if it is only brought up and not lost sight of.

Mr. STRAW—There seems to be quite a latitude in relation to this creamery question. I speak from a little experience. I am selling cream by the inch, and that is the universal custom in our section. Our butter factories adopted the Babcock test system and we sold cream that way until the farmers rather objected to it, and the change was made to buying by the inch. As a matter of fact it makes no particular difference to me, and I am not able to judge how it may effect the people of the State at large. I have no objection to amending my motion and including this resolution as well.

Motion amended to read as follows: That the Executive Committee of this Board be instructed to appear before the committee on agriculture at the next session of the legislature, asking that some action be taken on these resolutions.

Mr. HUNTON—The last remarks of Brother Straw show conclusively that there is no rule to go by. I am furnishing cream, perhaps $1,000 or $1,500 worth a year, and the people of my immediate vicinity furnish enough so that our creamery makes a ton and a half of butter a day. Our cream is sold by the space and tested by the Babcock test. We know how many spaces we furnish, and that is all we do know. Samples are taken each day, and those samples are tested, and the per cent of butter fat multiplied by the number of spaces gives the amount of butter. On the tenth of every month they pay us for the preceding month by the number of pounds, and give us just as many pounds as they have a mind to. That may seem a harsh statement, but the tests will vary with the same herd of cows in consecutive months. For the month of November my test was nineteen and a fraction, and for the month of

December with the same herd of cows and the same feed, 16.6. That difference in the tests made a difference to me of twenty dollars. If I should go to the creamery and ask what this variation means they would say, "We do not know; your cream tested such a per cent last month and such a per cent this month, and there is your money." This is not my case alone. I know of cases where in two consecutive months the tests differed from twelve to twenty. Either they do not exercise that care in the use of the Babcock test that they ought to exercise, or else they are dishonest. Brother Light is a practical butter man, and I have been talking with him on this subject, but he does not give me any particular light on it. It seems to me that this Board should take the initial step in these questions that are of such vital importance with us, and I did not want the resolution regarding the dairy interest left where it would be buried.

Mr. STRAW—I might say that the reason for the change in our section from the Babcock test to selling by the inch was that there was such a diversity in the money value of the same amount of cream as judged by the Babcock test that many of the farmers in the locality, refused to sell their cream by that method. That was what forced the creamery men to adopt the original way of buying by the inch. There were farmers in that section who claimed that they had the best cows in the section and had fed the best, that everything was conducive to their receiving the highest test, and those very farmers had received the lowest test. They argued that the quality of the cream was dependent to quite an extent upon the feed, and there was no reason why their cream should not test as high as their neighbor's cream whose feed was not so good, and so they refused to sell their cream.

Ques. Are these same farmers with these nice herds of Jersey cows willing to sell their cream by the inch as against their neighbors who have poor cows?

Ans. They went back to the former way of disposing of their cream by the inch and seem satisfied with it.

Mr. WHEELER—I want to say just a word in support of Brother Straw. Franklin county has been furnishing a number of creameries with cream, in part, and the more you talk with the farmers of Franklin county the more convinced they are that the old method of selling cream by the inch is the most satisfactory. They feel that they want to have hold of one end of the string.

We have been selling cream to eight or nine different creameries and a number of those creameries have gone down and we have lost money by them. Was it the fault of the farmers, or was it due to the business depression? To-day one factory in our section is trying to settle up with the farmers, offering them somewhere from thirty to forty per cent. The farmers have furnished the cream, and they have tested it and paid what they have had a mind to. Is there anything that this Board can suggest to help out this matter.

Mr. McKEEN—As we are on record in this matter I am glad to speak about it. You remember that at our Dairy Meeting at Foxcroft, Prof. Jordan and myself began an agitation in relation to the best way of buying cream for any purpose whatever, and the resolution of Mr. Light, as presented to the Board at this time is in direct line with this work. It calls for the purchase of cream by the pound, paying for it by the actual number of pounds of butter fat which the cream contains, indicated by the Babcock test; having nothing to do with inches, spaces or quarts.

Ques. Do you find that the farmers of the State have sufficient confidence in the Babcock test to sell their cream by that method?

Ans. I do, as a rule. We have formerly met with a great deal of difficulty in relation to farmers being dissatisfied with the Babcock test, but that is largely being outgrown and overcome. Much of the satisfaction that the farmers are feeling now is due to the law passed by the last legislature in regard to the inspection of apparatus, etc. I think where you find one farmer who will go back to the old system you will find one thousand who will object to it.

I would like to relate a little matter that occurred in the town of Pittston. A gentleman brought me five samples of milk in two ounce vials, to be tested. I could not test them there and told him that I would take them to the office. I put them on the window, and as we sat looking at those samples, a gentleman called my attention to the amount of cream there was in each one of those bottles. He took out a rule and we found that the depth of the cream was about forty per cent of the entire depth of the cream and milk. He said, "The idea of that man bringing you those samples of milk! It must be strippings or cream." I said, "It appears so, but we will take them to Augusta and test them." Mr. Smiley and I tested those samples as carefully as we could, and the highest test was five per cent. It was good honest milk, but peculiar conditions had caused the cream to rise in great abundance so that if that man had been paid for his milk according to the amount of cream there was in it he would have received forty per cent of the total amount of milk; if he had been paid by the per cent of butter fat he would have received only five per cent. That is what is bankrupting the creameries and leading to dissatisfaction on the part of the farmers. A gentleman told me he was on record as producing six and one-fourth inches of cream to the can. I asked him how he did it, and he said that just as soon as he strained his milk he put into it two quarts of very cold water, just as cold as it could be made. That explained the whole thing. The water got in with the cream and was measured with the cream. Milk itself is heavier than water, although cream is lighter. In the rising of the cream most of the water remains in the cream. All of these things are detected by the Babcock test.

Turner Centre creamery, before they began to use the Babcock test, detected the farmers putting ice right into their cans. In one instance the cream gatherer heard something rattling and found a piece of ice in the bottom of the can. The ice had not entirely melted in this case. It was a good deal like the horse jockey when he doctored the horse for the man to try, he put in just a little mite too much.

When we are all satisfied to sell cream by the pound and have it tested by the Babcock test we have settled the whole thing, in my opinion.

Mr. HUNTON—I think farmers are satisfied with the Babcock test just to the extent that the man who manipulates it uses care. If he has plenty of time and tests the cream carefully, I believe it comes out all right. But I do believe there is a want of time and care in testing the monthly samples of cream.

Mr. McKEEN—Don't you believe that more difficulty arises from the cream gatherer being careless, and not collecting his samples properly?

Ans. That is very true.

Mr. LIGHT—I am very glad to hear this discussion,—I rather expected to hear it before. I want to say in relation to what has been said about the creamery man having both ends of the string and the farmer neither, that I do not think the adoption of that resolution or any legislation growing out of it would tend to weaken the farmer's position, but rather to strengthen it. Much has been said here in regard to the percentage of butter fat in cream, and stress has been laid on the cows and the feed. It does not follow because a man has a good herd of cows and they produce a large amount of butter that the cream from that herd is going to test high. The milk may test high, but the farmer takes that milk and places it under varying conditions. By his manipulation of that milk he can produce at his will high testing cream or low testing cream. I can prove that to you, or you can demonstrate it yourselves. You know that the cream raised under the old pan setting system would contain thirty per cent or more of butter fat, while I have seen cream that would not test more than ten or twelve per cent. I say the farmer can manipulate his milk so as to produce rich cream or poor cream, but the Babcock test will show its true value in butter fat.

I contend that weighing the cream is more accurate than measuring it, under ordinary conditions, because in transferring cream from one vessel to another you cause it to froth, and it is sometimes difficult to tell just where the line is. But in weighing the cream there is no variation, providing your scales are correct, as you expect them to be. The farmer can see the weight of the cream, and he has a chance to see that the cream gatherer takes a fair sample of the cream at that time. The farmer ought to be interested enough to see that the cream gatherer is honest and careful and takes a fair sample. Now under the law, the Babcock machinery,—the bottles and all the glass ware—is tested, and the manipulator is certified that he is qualified to determine the amount of butter fat; and when this sample is carried to the butter factory the amount of butter fat is determined right there, in pounds, and you have no further reckoning to do. Just fix your price on the butter fat and you have it. If you should go further and churn that butter fat, then another element of variation comes in. It is ordinarily allowed that the butter fat increases about fifteen per cent in weight in churning. The United States Experiment Station gives about sixteen and two-thirds per cent as the average. The increase may be all the way from ten to twenty-five per cent. Now, then, if the butter-maker makes that variation it may work to the farmers' injury, and he cannot help it. But if he stops at the butter fat, that element of variation does not enter into the question.

The farmer has another remedy, the butter-maker is not the only man who can have a Babcock tester and who can manipulate it. What is the reason that every farmer cannot have a Babcock tester and learn how to use it, and see if he is getting a fair, honorable test at the factory?

I am buying cream, and according to my system the cream gatherer collects the cream of the farmers, weighing it, and (once a month generally) taking a fair sample of it. I test that sample and determine the number of pounds of butter fat in the cream. At the end of the month, as I reckon my accounts, I have the number of pounds of cream, according to the cream gatherer's record, and the percentage of butter fat, shown by the Babcock test. And so I can determine the exact number of pounds of butter fat that I have bought. I sell my butter in the markets and keep a correct record of the number of pounds I sell and the gross proceeds of the sale, and in that way I can very easily reckon the average price per pound that I have received for the commercial butter during the month. We will assume that it is twenty-five cents. If I purchase 2,000 pounds of butter fat for the month, and sell the commercial butter at twenty-five cents per pound, I pay the farmer for his butter fat twenty-five cents per pound; that is, delivered at the factory. You see what I get as a sort of a toll is this increase in churning, which has to pay for my labor and all the expenses of marketing the butter.

Mr. McKEEN—I would like to have Mr. Light tell us about what he gets per pound for manufacturing and selling the butter.

Mr. LIGHT—I think about three and a half cents a pound; between three and a half and four cents.

Mr. McKEEN—To carry this idea a little further I want to say that the largest creamery in the world, in St. Albans, Vt., is buying the milk of the farmers, separating the cream and manufacturing the butter, and it has a contract that the expense shall not exceed three and a half cents per pound in summer and four cents per pound in winter. So Mr. Light has got at just the same practice as the creamery in Vermont. You see he is not getting an extravagant amount, and yet he is getting enough to live and do a good business, and that is what every creamery man has to do.

Mr. LIGHT—I want to say in regard to how that works, in the months of May, June and July nearly all the creameries in Maine make a much larger amount of butter than at any other time of the year. I make three times as much in those months as I am making now, and the larger the product, the more economically you can make it. During those months the price of butter goes down quite low, consequently my gain is less, I am getting a less price on this toll. When the price is low it works to my disadvantage, but I am making so much more butter that the expense per pound is less. At this time of the year I am making less, and consequently my toll is worth a little more. I know of a creamery in my county in which the expense of making the butter I will venture to say is two or three times as much a pound in winter as it is in summer because they are making so much less butter in the winter, while their expenses are about the same.

Motion of Mr. Straw as amended, carried.

MR. HOLLAND.

Mr. PRESIDENT, MEMBERS OF THE BOARD: I suppose that each member present is jealous for his own county and for its benefits. I wanted to make a motion here, but before presenting it I wish to make a few statements. Of course we know that water will find its level; and wherever an industry is beneficial it will increase. For instance, if the dairy business pays well in a certain part of the State we are naturally inclined to think that the number of cows will increase in that portion of the State. But if in a certain section the butter is of a poorer quality and commands a less price we naturally suppose that the number of cows will decrease. I find in looking over some figures this morning that in 1892 there were 138,994 cows in the State, and in 1894, 141,262. an increase in the two years of 2,268 cows. In referring to the different counties I find that in five counties, including Penobscot, and counties around it, the cows have decreased in number 2,222. It seems to me, therefore, that this Board should take some action, if possible, to help out the dairy interests in that part of the State; and I move that the next Dairy Meeting be held in Penobscot county at such time and place as the Executive Committee may designate.

Motion seconded by T. E. Skolfield.

Mr. FLINT—The people of North Anson, in fact nearly all of that county would like the next Dairy Meeting to be held in Skowhegan. It is a village large enough to accommodate the meeting, and a village willing to take part in it. We generally claim that where a place is just large enough for an association and willing to take hold with it, that it is better to hold it there than in a larger place. Consequently, I move that the next meeting be held in Skowhegan.

Mr. HUNTON—Winthrop puts in a bid for the next meeting.

Mr. HOLLAND—I find that the decrease in cows in Penobscot county for the two years was 1,145, and I think that my claim for having this Dairy Meeting held in Penobscot county is ahead of that of any other county. The decrease in Waldo county was 425, Piscataquis 223, Somerset 64 and Washington 365. We want to increase our stock. We can produce all kinds of food for cows, and we can just as well increase the number of cows as not. We find that Denmark put into the United Kingdom in one year 28,996 tons of butter, and we have some ten thousand more square miles in the State of Maine than Denmark has. Why should we not produce a great deal more butter and cream than we are producing at the present time? But how can we do this unless the dairy interest is fostered by this Board of Agriculture? It seems to us in that section that his thing has been rather one sided. The Dairy Meetings have been held over in this part of the State; while our own county is large and productive and I think the Board could not do better than to help us out in that section of the State.

Mr. STRAW—There is a sense of justice in this. I believe the strong places are able to take care of themselves, it is the weak ones that need our assistance. We have just as good surroundings for the manufacture of butter as any other part of the State, and we have been neglected in the way of Dairy Meetings, being weak as compared with many other places. I suggest that York county offers the request that you hold your next Dairy Meeting in that county. I believe that it is our duty to look after the interests of the State from border to border, and that we should not make a specialty of any one particular location in the State, even though it may cost a little more to go elsewhere. I believe that there are certain localities that offer just as many inducements and have just as good facilities, that have been neglected, and I think those localities should receive the attention of this Board.

Mr. VINTON—The custom heretofore has been that the Executive Committee has determined where the Annual Dairy Meeting should be held, and up to this time they have been guided by such applications as have been made for the meeting, and such facilities as the places could offer, especially in the way of hotèl accommodations.

Mr. STRAW—If it is not out of order and is not discourteous to any one I would like to inquire where the Dairy Meetings have been held since Brother McKeen's term of office began.

Mr. MCKEEN—The first Dairy Meeting was held in Oakland, the next one in Winthrop, Kennebec county; the next one in Orono, Penobscot county, and one was held the same year in Auburn, Androscoggin county; the next one was held in Brunswick, Cumberland county, but under the auspices of the Sagadahoc Agricultural

Society; the next one in Foxcroft, Piscataquis county; the next one in Farmington, Franklin county; and the next and last one in Norway, Oxford county.

Mr. FLINT—It seems reasonable that his matter should be left to the few rather than the many, and I think it would be well to leave it with the Executive Committee. The Secretary well knows that the manufacturers of dairy implements have a good deal to say about it. We need a good exhibit of dairy implements, and in some places they say absolutely that they will not exhibit, and that excludes us from those places. In other places they are pleased to exhibit, and their machinery, tread powers, separators, etc., give a wider range to our exhibit. It makes quite a difference where we can get the best exhibit, not of butter only, but of all these other things.

Mr. VINTON—The Executive Committee are already in possession of two pressing invitations, from Dexter and Skowhegan.

On motion of Mr. Straw, voted, that the motion of Mr. Holland that the next State Dairy Meeting be held in Penobscot county at such time and place as the Executive Committee may designate, be laid upon the table.

On motion of Mr. Skolfield voted, that a committee of three be appointed, one of which shall be the President of the Board, to confer with the officers of the State Grange in the matter of a union Grange and Farmers' Field Day Meeting sometime in August at Old Orchard. Mr. Skolfield and Mr. Straw were appointed to act with the President on that committee.

Mr. VINTON—I want to say a few words in regard to this meeting, I felt much more in favor of such a meeting last year than I do this year. I based my calculations as to the desirability of such a meeting upon the very little interest that apparently was taken in our Institutes, especially in Cumberland county. I have been long convinced that our Institutes in the newer eastern portion of the State have been decidedly better attended and much more appreciated than those in our section. But we have been lucky enough to hold one Institute in Cumberland county that has been worth more than all the others that have been held in that county since I have known anything about the Board, and I hope that our people are waking up to a better appreciation of these Institutes. Our plan, you know, was to let this meeting take the place of some of the Institutes, as the expense of it would be about equal to that of two or three Institutes. I said right away last year, "You may take one Institute from Cumberland county, and I don't care if you take both of them." But do not let us think of having such a meeting as this unless the members of the Board and the farmers and the Grange, acting together will lay themselves out to make it a success. We do not want to undertake a meeting of this kind and make a failure of it.

Adjourned until 2 o'clock, P. M.

THURSDAY, P. M.

W. H. VINTON—The matter of procuring the pictures of the Ex-Secretaries of this Board to be hung on the walls of this room came before the Annual Meeting last year and was left with the Executive Committee. The committee, in the discharge of that duty, must of course have a view to our limited funds. We did not dare to go into the matter very much, but we did say that we will at least make a beginning, and so of course began at the beginning. We have procured a picture of Dr. Holmes, the first Secretary of the Maine Board of Agriculture. Dr. Holmes in all his early life, before my day, was deeply interested in and connected with the people and business of my native town, the town of Paris in Oxford county. But when I came to know him he had removed and lived at Winthrop. My early connection with Dr. Holmes, and knowledge of him, was not as an agriculturist, not as a leading man in agriculture and editor of the Maine Farmer, nothing of that kind. My early knowledge of Dr. Holmes was in quite a different field. I knew him as an anti-slavery man, an old fashioned anti-slavery man. It is vain at this late date to attempt to give to any audience, either large or small, any idea of those early men. We talk about them but we do not know much about them. The cause was weak then, but there were a few towns scattered over the State where the seed had been dropped and was taking root, and those of us who migrated around, hit upon these towns as a sort of Mecca in the wilderness. Conspicuous among them was Winthrop. There, were found Seth May, Thomas Card, and the Bishops, two or three of them, and Dr. Ezekiel Holmes. Now these men of these early days were men of such deep convictions that it was of no use to hurl after them any epithets, as men of one idea, impractical, or anything of that kind. Their convictions went right down and took hold of the bed rock. They recognized what really was not recognized in large portions of this country, and was not more than half recognized where it was pretended to be, they recognized in the slave a man and a brother. They said that to sell men and women, especially women and girls, upon the auction block under the auctioneer's hammer was the gigantic crime of crimes and appealed to Heaven for judgment and would receive swift and descending wrath. And these early men in the anti-slavery cause were statesmen,—we had statesmen in those days. They went all over this State from town to town and from village to village, and prophesied that unless Congress awoke to the importance of this question and took hold of it, it would inevitably involve this country in civil war, and in that civil war the institution would go out. The "irrepressible conflict" of Mr. Seward led directly to that issue. Prominent among such men was Dr. Ezekiel Holmes. The strong purpose, the unconquerable will, the grip with which he held on to things, are revealed in his face, which face I have now the very great privilege of presenting to you, and at the same time I will introduce to you Mr. Howard Owen, who will speak upon "The Life and Character of Dr. Holmes."

MR. OWEN.

Dr. Ezekiel Holmes, the first Secretary and executive officer of the Maine Board of Agriculture, was the second son of Nathaniel and Asenath (Chandler) Holmes, and was born on the old Holmes homestead in Kingston, Mass., and in the same house where three generations of his ancestors had lived, on the 24th day of August, 1801. He was the sixth in descent from William Holmes, who was born in England in 1592, and was at Scituate, Mass., in 1641, and twenty years later at Marshfield. He was a distant relative of both the poets, Bryant and Longfellow, inheriting something of their refined and poetic nature. He was also a relative of the noted John Holmes of Alfred, who was the first United States senator from Maine. He received a collegiate education at Brown University, graduating from that institution in 1821, and came to this State soon after. His uncle, Dr. Seth Chandler, had previously settled in Maine, and his son, Dr. Benj. Chandler, was in practice at Paris Hill. Young Holmes studied medicine with him, attended the medical lectures at Bowdoin College, from which he received the degree of doctor of medicine in 1824. He married about the time of his graduation Sarah Elizabeth Benson, daughter of Job Benson of Livermore. His health being of a delicate nature, he did not enter at once upon the practice of medicine, but in November, 1824, he went to Gardiner as instructor in natural history in the old Gardiner Lyceum, founded by the munificence of Robert Hallowell Gardiner. A writer in the October number of the journal of the Franklin Institute, Philadelphia, claims that the Gardiner Lyceum was the first trade school established in the United States. The subject of enabling mechanics and farmers to become skilful in their respective pursuits had occupied the thoughts of the promoters of this new scheme for years prior to the passage of the legislative act establishing the lyceum in 1822. The originators of this school, state that they knew of no organization in existence like the one they had in mind, from which to copy, and therefore they would be compelled to proceed altogether upon original lines. The school was successful in its objects, but it was evidently too far "ahead of the times," and so languished, and finally was closed for lack of sufficient support and patronage, in 1832. The doctor was connected with the school until its doors were closed.

Like many another whose culture had led them in the direction of medical science, he early and devoutly sought the study of nature as connected with agricultural pursuits. He started in 1828, at Gardiner, the publication of the Farmer's and Mechanic's Journal, a monthly publication of considerable merit, but which was discontinued at the end of one year. In 1832 he removed to Winthrop, where he engaged in farming and the practice of medicine.

In January, 1833, he started the Kennebec Farmer, the name of which was changed to Maine Farmer before the close of the first volume. The paper was soon after moved to Hallowell, then back to Winthrop, and in 1844 to Augusta, where it has since been published. During all the changes and mutations in the publishing department, Dr. Holmes continued at his post as editor of the Farmer, with rare exception when engaged in the public service, until his death, furnishing matter for its columns regularly every week during a period of thirty-two years. At his death, therefore, he was by many years the oldest editor in the State in continuous service. He was professor of Natural Science in Waterville College from 1833 to 1837. In 1835 he was appointed to make a survey of the public lands of Maine and Massachusetts, under a joint resolution of the legislatures of the two States, a duty which was faithfully and ably performed by him.

He was for five years successively elected a representative to the legislature from the town of Winthrop, and had the people of that goodly town possessed the power they would have chosen him unanimously President of the United States. He also served several terms in the State Senate from this district. In 1852-53 he was the Liberty party candidate for governor. While in the legislature he aided materially in the passage of the bill establishing the Maine Board of Agriculture, the act being passed in 1852. He was its first Secretary, occupying the position three years. His three volumes of reports have been models for those who have succeeded him in the office. In 1861-2 he assisted in a geological survey of the State, and his reports of the same are highly valued and often quoted. While at Paris, in company with Prof. Hamlen, he discovered the tourmalines that have since become so famous, and some of which are so valuable.

He was also the first Secretary of the Maine State Agricultural Society. He was one of the founders of the Kennebec Agricultural Society at Readfield, continuing until his death an active and useful member of the same. At the time of his death he was the vice president of the National Agricultural Society, and of the New England Society, which was organized in 1864.

Dr. Holmes was greatly interested in improving the stock of the State. He was among the first to introduce the Shorthorn blood, and to him is due the credit of founding the famous breed of butter cows now known as the Maine State Jerseys. Winthrop is the radiating centre of this noted breed, and it is so because of the seed planted in faith, and so intelligently, by Dr. Holmes.

Dr. Holmes died on Thursday evening the 9th of February, 1865, at the age of sixty-four years, after a brief illness, from a severe cold while in attendance upon the agricultural committee at the State House, maturing plans for the establishment of the State College. Bowdoin College and Waterville College proposed to annex this to themselves, in order to secure the government aid. The doctor believed that the interests of the State would be better subserved by an independent school, and enforced the idea before the committee and in ringing editorials in the columns of his paper. He died as he had lived, fighting for the farmers of Maine. He was buried in the cemetery at Winthrop, where a humble tablet marks the resting place of one of Maine's most noble and unselfish benefactors.

As I gaze upon the plain but intelligent face—a face strongly marked by character lines—looking out from this portrait, I recall his presence on each Monday afternoon, as the stage rolled in from Winthrop. In storm or in sunshine he was always beside the driver on the box, and always held in his hand a huge umbrella.

But the slow and lumbering stage coach failed to represent the active thought of that great mind that chafed for expansion amid the somewhat narrow environments in which he found himself. For this man was a born leader, whose thought went far ahead of the ordinary trend of public opinion. Read his editorials, listen to his public utterances of thirty or forty years ago, and in them are shadowed forth and painted as it were on phantom canvas, the great strides in the natural sciences which this generation is realizing, while he sleeps under the pine and the oak.

The doctor remained in Augusta over Tuesday to complete his editorial work on the paper, the most of which he did in Winthrop, and always returned home Wednesday morning.

He wielded a ready and vigorous pen, and it was ever employed in the interests of the public good. Hating the institution of slavery with a vigor that allied him in fellowship to Phillips and Whittier, had he chosen the arena of politics, he would have been numbered among those abolitionists whose names shine most resplendently on the pages of history.

His style of expression was always pure and simple, never stilty. Most of the current topics came within the scope of his ready pen. His wide range of knowledge enabled him to write with the greatest ease. Wrong and injustice never went unrebuked. The horde of humbugs and swindlers that so often find the farmer an easy prey, were smoked out. Loyal and patriotic in his utterances, there was no mistaking the tone of his articles, every word and line of which conveyed a meaning. He never wrote to confuse or perplex, but always to enlighten and help.

Personally, he was modest and retiring. A nephew, one of the leading business men on the Kennebec, said to me the other day: "I used to think my uncle very careless as to his own welfare, and judged him to be so in all things. Hence I was very much surprised during a short visit at his home in Winthrop to see him dispose of his mail—and it was a large one that day—in the most thorough and systematic manner, at one sitting. I then changed my mind regarding his character, and concluded that he sacrificed everything for his profession. I remember a little incident that occurred during this visit that was amusing, if not instructive to me. His old house was in very bad repair, and his wife suggested that it would be well to take it down and rebuild. His answer was characteristic: 'Let it alone, and it will tumble down soon.' "

There is a story in the Holmes family, that when the doctor's father sent him to college some neighbor asked one of his brothers why "Zeke" was sent instead of one of the others. His reply was, "He had to send 'Zeke' to make him as smart as the rest of us!"

If that be so, the "rest of them" must have been a very smart set! Dr. Holmes always had a quaint way of expressing himself. This indeed was a family trait. In a letter to his brother, Philip C., he wants Philip "to look into that lathe which turns lasts, gunstocks and bureaus." This was the famous "Blanchard Last Machine," and was considered such a marvel in machinery at that time that it is no wonder he suggests the idea of turning bureaus with it.

Finally, this man lived, not for himself, but for others. His heart never had a selfish pulsation. He was a much better friend to others than to himself. He was much more interested in the welfare of others than he was in himself, with the usual result—he was always poor in purse. Careless in business affairs, knowing nothing of the value of money, in the accumulation of property he was an utter and deplorable failure. Were he member of the House of Representatives at Washington, he would never be selected as chairman of the ways and means committee! He could guide others to wealth and prosperity, though the way seemed to be hedged up to him. No mendicant ever appealed to him in vain; no tramp ever asked him for his last dollar but he got it. One day his good wife scraped the bottom of the flour barrel—it was an ominous sound that the doctor had heard before. Ezekiel went forth with the only half dollar he then had, to make a purchase at the corner grocery. But on his way he met a tramp, who wanted the half dollar. Ezekiel returned home with a light heart, but without the flour. Were he living in these days of tramps and strikes, what a paradise would open to his vision of benevolence.

This utter abnegation of self was condemned by many, but to me it was Dr. Holmes' chief crown of rejoicing. In a cold, cruel and uncharitable world, where men trample upon each other in the hot pursuit for the glittering but fading prizes of this mortal life, it is an inspiration to have known one pure, sweet soul, who with talents and ability that might have been used for self aggrandizement, put it all aside, and permitted his own life to melt into the lives of others.

On motion by Mr. Moody voted, that the thanks of the Board be tendered to Mr. Owen for his admirable production on the life and character of Dr. Holmes, and that he be requested to furnish copy for publication in the Secretary's report for the coming year.

Remarks by Mr. John Deering and Dr. Bailey, representing the cattle commissioners.

Five minute talks by members, each to suggest lines for Institute work for 1896.

ANDROSCOGGIN COUNTY.

B. F. Briggs.

Mr. President: I believe that our Secretary is doing very successful work along the lines that he has pushed to the front, still I think there may be other lines that we ought to take a little more notice of. Our farmers are not constituted alike, we cannot all make successful dairymen or successful orchardists, hence the necessity of our being informed on the line in which we do take an interest and for which we have a taste. One of these lines that I think has not received the attention it demands is the breeding of stock. I believe that we should raise our own stock in the State of Maine, especially our dairy stock. And as the cow is the foundation of all successful dairying we should study the science of breeding so that we may raise a larger proportion of profitable cows. What proportion of the farmers, think you, take any interest in this matter? If there are two sires in the neighborhood, and one is a first-class, thoroughbred animal, and the other a scrub they will patronize the scrub if by so doing they can save twenty-five cents. They do not seem to realize that had they patronized the other they would have made fifty times that amount.

And I believe the time is at hand when our farmers can raise beef at a profit if they only understand the business and feed aright. And so sure am I that horses can be raised profitably that I am willing to risk my reputation as a member of this Board and as a business man, in recommending this industry. I believe if this Board of Agriculture had spent one quarter the amount of time and money in educating the farmers in this branch that they have in other branches, our barns would not be filled at the present time with small worthless horses.

AROOSTOOK COUNTY.

J. W. Dudley.

Mr. President, Gentlemen: I do not know as I could think of any new lines to start out on in our county. I would say that during the last year at our Institutes we have taken up dairying, stock fodders and farm fertilizers; and in connection with the talks in regard to dairying, Brother McKeen has spoken in regard to breeding from the right kind of stock to get this dairy stock. I think possibly it would be a good idea, if we were going to add anything, to introduce this question of stock breeding in our Institutes, and perhaps the growing of small fruits. We had a Joint Winter Meeting in our county this winter, and we have got our farmers well waked up in regard to fruit growing, for home consumption anyway, and I think that this subject might be taken up at our Institutes and be beneficial. I am well aware that there has been a great deal of good done in our county in the Institutes, and the interest seems to be on the increase, for they are calling for Institutes in different sections where they have never had them.

FRANKLIN COUNTY.

C. E. Wheeler.

Mr. President, Members of the Board: I do not know as I can think of any new lines of work that have been brought to my mind by the farmers of my county. They will go to an Institute and be interested, no matter what subject is presented. It makes but little difference whether the subject is dairying, orcharding, small fruit growing, or what, it will interest somebody, and as the years go by the interest increases.

There is one thing which I think it is well for us to consider here to-day, regarding our work throughout the State. We have in the past through the Executive Committee or the Secretary hired men from abroad to talk to us upon certain subjects which we deemed of great interest. I wish that our Secretary, or the President, or Ex-President of the Pomological Society, or some other men, could be sent out into certain states which are well recognized as understanding the work of certain lines. They could come home and tell us what they had learned, and I think it would be better than to bring these speakers here at a large expense. The matter was brought up yesterday, I think, regarding the manner in which the money appropriated for the personal expenses of the Secretary should be expended. I wish some of it might be expended in this way.

KENNEBEC COUNTY.

W. G. Hunton.

Mr. President, Gentlemen of the Board: I am very fortunate, perhaps, in representing a county that has taken quite a decided stand in nearly all of the important industries connected with agriculture. Winthrop, the center of the Jersey Association, is in this county; one of the most active members of the Pomological Society, Mr. Pope, is in this county. In orcharding and dairying Kennebec county has for a number of years tried to educate itself, and I presume without doubt those two topics are the ones that would interest the people of my county more than any others.

I think that the farmers as a rule do not try to benefit themselves as much as they might. A gentlemen who has travelled somewhat in other states told me he thought I was a little cranky on the subject. He said that after returning from other states he felt like taking off his hat to every farmer he met in Maine. But I believe it ought to be the work of this Board to impress upon the farmers in some way, especially in this coming year before the legislature meets, that it is absolutely necessary for them to do some thinking, and to have some idea of what they want. I think that idea should be kept in mind through all the Institute work. These resolutions that have been adopted here and referred to the executive committee are aiming in the right direction. Now if during the year we can get the farmers interested in these matters, they will be interested in their elections next fall to send a representative to the legislature who will have an idea of what they want.

KNOX COUNTY.

E. E. LIGHT.

MR. PRESIDENT, GENTLEMEN: I cannot think of any new lines to suggest. I believe that stock husbandry is the basis of our prosperity in agriculture, and that all lines of stock husbandry should receive attention. The greatest promise is now from the cow, and I think that any increase in stock had better be by breeding instead of by purchasing from outside. And I believe that much attention should be given to the matter of giving instruction in a more careful, wiser breeding.

Then, also, the subject of more economical feeding by producing fodders, should be considered; and farmers should be awakened to the dangers of buying so much deleterious seed. Also I think the subject of improved country roads needs a good deal of agitation; much improvement could be made by the use of means which we already have, although any radical road improvement must entail a vast expense that we are not ready now to bear.

LINCOLN COUNTY.

J. M. WINSLOW.

MR. PRESIDENT: Since I have been a member of the Board I have felt some duty on myself as I went over the county, and I have noticed the different modes of farming more than I used to, and I have noticed some things in my county that need a radical change. I think the first is stock feeding. There is a wasteful disposition among the farmers in my county (I don't know but I am safe to say as a rule) in feeding their stock. They not only allow the stock to waste the feed but destroy their appetites, and consequently have poor results from their feeding. I have been in many barns this winter and found cattle actually bedded with the good, upland English hay which they had not eaten. That is a wasteful way of feeding, we know. Also I think the question of stock breeding has been greatly neglected, and there is more interest in it at the present time than there has been since I can remember.

Another very wasteful way of doing business on the farm is in taking so little care of the dressing from the farm stock. You can find it piled up in the fields all over the county. Every farmer does not do this, but it is done as a rule.

These are the lines that I think, for the benefit of the farmer financially, need to be looked after more than any thing else that I can think of.

OXFORD COUNTY.

S. F. Stetson.

Mr. President: The line of work which I should advise would be in reducing the cost of production, not keeping two cows to do the work of one. It would be much better economy to keep one good cow than to keep two poor ones.

PENOBSCOT COUNTY.

G. N. Holland.

Mr. President: I would say in regard to the line of work which I should like to see pursued in Penobscot county, it would be something which I proposed some ten years or more ago, when there was no creamery in the vicinity. We had several meetings, and I urged this important fact upon the farmers, that we needed to keep more cows and export less hay. We have been in the habit, in Penobscot county, of selling hay, and I have felt for years that we ought to keep more stock and increase the fertility of our farms. And this would be the line of thought which I would like to have presented at the Institutes.

PISCATAQUIS COUNTY.

W. H. Snow.

Mr. President: I do not know as I can suggest any particularly new lines for work. As I told you last year the farmers in my vicinity have done considerable work outside of their farms. On account of the forests and streams near us more or less lumbering has been carried on, and in a great many cases the men have hurried through their work in the fall, and got a job and gone off somewhere for the winter, leaving the farms to take care of themselves. They have changed somewhat, and are thinking that it is a little better if they can stay at home and by taking good care of the stock get as much out of it as they would get by going into the woods. What we want there is more enthusiasm about the work. We had an Institute there this fall, and although the travelling and weather were very unfavorable it resulted in a great deal of good. The question came up, when the farmers found I was coming here very soon, whether they could not have more Institutes. One man stopped me the other day and wanted to know if they could not have another right away. One subject which is very important, as all have said, is the raising of stock. There are a good many farmers who would like to keep more stock, but with their small farms and short pocket books they can hardly buy any nice stock. They are improving a little; and I think it would make the work more effectual, perhaps, if each member would look over his own county and see what is needed. In the central part of the county, dairying is receiving lots of attention; the farmers are engaged in it quite extensively. In the upper part of the county this is not so much the case, though they want at some time to have an Institute there to liven them up about the work.

SAGADAHOC COUNTY.

T. E. Skolfield.

Mr. President: In Sagadahoc county for the last four or five years we have had speaking on about all the subjects that I have heard of, by expert speakers, and I don't know as I can suggest any new line. Sagadahoc is a pretty small county. Sagadahoc proper contains only about 300 square miles of land and water, and a good deal of it is water. And yet we have about all the industries that you have in the large counties, more than you have in some of them. The first of these industries, which I think would be of the most benefit to the farmers, is dairying. Some parts of the county are well adapted to dairying, pretty near the market and on the line of the railroad. Taking the county as a whole, I think that would be one of the most profitable lines of work. In other parts, orcharding would do well. The southern section is pretty rocky and hilly. and broken on the coast. We used to think that orchards would not grow there, but now we have as fine small orchards as there are anywhere. And with orcharding, would go the small fruits.

Another industry would be stock raising. We have a pretty good chance in that little county for stock raising; we are near good markets.

And the last line would be poultry raising. Very few people raise poultry there, and yet if we raise early chickens we can send them to Boston in a night and get a pretty good price, sometimes $1.50 a pair for small chickens.

I think the interest in these Institutes is increasing in our county. The people take a great deal more interest in them than they used to. I have not heard much criticism of the last two. Before that there were criticisms made about "that man coming away down here from Penobscot to talk to us," but they are beginning to think that perhaps the man from Penobscot did know a little something. The farmers have sometimes furnished a little provision for Bowdoin College, but the steward buys a good deal in Boston or Portland. Nearly all of the green food comes from Portland; and that is about the way with the hotels. They may leave a little money in the town but it is a very little.

Mr. McKEEN—Do these people have a prejudice against the natives? Would they not buy of the farmers if they could be supplied in sufficient quantities?

Mr. SKOLFIELD—If the farmers could supply them at regular intervals in sufficient quantities they would probably buy of them. When they make a contract with Boston they know just what they are going to have the next day. While if they relied on the farmers they would sometimes be short. Years ago the farmers used to supply them with poultry, lamb, a good many vegetables, apples, beans, green peas, etc., but of late years very little has been done by the farmers in this line. Years ago there were 2,000 sheep in our town but last year there were only 734, so that it would be impossible to supply them with what lamb they wanted at the time they wanted it. And it did not pay us; we can sell our lambs to the buyers at just as good a price as we could get for them there.

SOMERSET COUNTY.

GEORGE FLINT.

Mr. PRESIDENT: There is no doubt, when we get to the bottom of all that has been said, that the interests of the State of Maine are best subserved by the development of all its industries, and there are opportunities for every man in it. What we have seen and heard here to-day leads us to believe that we are not doing anything in comparison to the opportunities we have. The statement of the last gentlemen shows that Massachusetts can produce these foods and ship them to us, and can afford to do it, as she would not do it unless she could afford to do it. The same opportunities are offered to us. We have railroad connection, electric cars, steam boats and navigation. There is no part of the State but can reach Brunswick as easily as it can be reached from the cities of Massachusetts. Then we come right down to cheap production, economic use of labor and machinery, and the application of the science of agriculture as developed by the chemist as well as by the machinist; and we can only blame ourselves if we do not hold our own markets. That is the only way that I can see in which we can improve upon past systems of farming, by developing our own resources and depending less upon western grain; because if anything has been proved to a certainty, it is that we can raise corn in the State of Maine as cheaply as it can be raised in Ohio and shipped here. Land in Ohio and Kansas is worth more per acre than land in New England. We cannot buy land there to-day short of $50 per acre, or about that, and we can buy farms in Somerset county for that price, that will contain ten or twenty acres of land. We have been looking to lumbering and manufacturing, and neglecting agriculture; and now when we turn our attention to agriculture, I hope the Board, as well as every farmer in the State, will exhibit the same energy that we have been devoting to other purposes.

WALDO COUNTY.

W. H. Moody.

Mr. President: If you want to get a man's attention and use him, you must contribute to his greatest necessity. If he is hungry you must feed him and if he is cold you must warm him; you must get him into a condition in which you can get his attention before you can do much with him. The necessity in Waldo county, for a majority of the farmers, is a little ready money; and it is useless to talk to them about planting an orchard, which they may reap the benefit of in twenty years. It does not contribute to this great necessity. And it is of very little use to talk to them about embellishments and small fruits for their own convenience and comfort. Of course some of them have these, but the majority of them are thinking about the tax to be paid next week and the barrel of flour to buy to-morrow. I think what we want to do in the county is to lay before them something that is readily available, and I believe greatly in dairying. I know from three years' experience as a member of this Board, travelling over the county and holding Institutes, that the people have become very much interested in the dairy business. They have only just started in the work but the interest is increasing very much, and I think that the work of the Board should be in that direction for the next three years. Of course we can take up other subjects in the Institutes as well, but I think that is the industry that can be readily taken up and yields ready and sure returns. In my farming I never was able to figure to tell anywhere near what I was getting, until I came to the dairy business. I never made much of any mistake in that.

I think that we should endeavor to put all the money that we can possibly spare from our appropriation into Institutes; I believe we reach the people better in that way than in any other. And I believe that our own people are more available and more useful than any other speakers. I mean practical men from Maine who do not talk over the heads of the people. They can tell men about their own experience, and I think they reach them more readily and do more good.

YORK COUNTY.

L. O. STRAW.

Mr. PRESIDENT: York may be last, but I hope the county itself is not least. The line of Institute work in York county is already defined. January 21, 22 and 23, we are to hold three Institutes in York county. I thought the matter over as carefully as possible, and I believe that the two leading industries in the county are orcharding and dairying. We have a diversity of industries, but these two are the special industries, and I firmly believe in a specialty. I believe that every farmer should furnish his family, and his friends it may be, with all the nice little things that come from the garden, in the way of small fruits, but the leading industry must furnish his pocket-book with money. We have always argued that two cows might pay the running expenses of the family; but when you stop with two cows you simply furnish the family, without any ready money. If two cows will pay the expenses of the family, six cows will three times pay those expenses, and the amount over and above what it takes to maintain the family is so much ready money. That is the only way, in my experience, that men of wealth have accumulated their wealth. It is by speculation, and the speculation comes because of the reaching out, and doing more, and more, and more, in one line of work. This is not confined to farming, it applies to everything. Daniel Webster, Calhoun, Clay, and many others that we might mention became great lawyers because they were specialists in that one particular thing. It is the same in our industries on the farm. We have in our vicinity a few orchardists who are reaping a reward every year. They are getting from five hundred to four thousand dollars a year for the fruit. Now the question arises in my mind very frequently, if my neighbor can realize $500 from an orchard five times as large as mine and I have equal facilities why don't I take advantage of the opportunity and get so much extra money? The trouble in our county, in my opinion, is a lack of energy on the part of a great many of our people in this particular line. I have suggested these two industries, orcharding and dairying, because they are lines upon which I think the farmers in general can receive a greater benefit than from any others.

CUMBERLAND COUNTY.

W. H. Vinton.

I will say just a word that occurred to me, in regard to Cumberland county, and it is applicable to any other county. I think we should not only undertake to instruct the farmers in regard to certain industries, but we should give them special instructions in regard to certain matters pertaining to these industries. For instance, we talk about dairying and say it is the great and leading interest of the State, and so it is; and farmers will say to us, "Isn't there danger of this matter being overdone? Are we not going to glut the market, and is butter going to be worth anything?" We are accustomed to say, "There is no danger, none at all; just go right on making butter." I want to say that in my opinion that is not safe instruction to give to any man, because I believe that with Yankee ingenuity nothing can appear upon the farm or anywhere else in Maine, but that if it turns out to be a profitable business so many will go into it that a glutted market will be the inevitable result. It will be overdone right away. To illustrate; we have had some men in this State who for a series of years have made some money in getting Christmas trees for Boston, New York and Philadelphia, more especially for the two latter cities. Several carloads have been shipped out of my county during the last ten years. There was money to be made in it. But this year everybody went into it; one town reports thirty odd cars shipped, and the result is that the business is destroyed. It will be so in any business. We say that we cannot glut the market with strawberries, but something of that kind can be done and is done. My point is that in dairying we should instruct the dairymen to make a nice product, to cater in their butter making to the nice taste, so that they can get the highest market price in Faneuil Hall or anywhere else. There is no danger of over-production of this nice butter. If there is a glut in the market it will not be in the high grade goods. I was reading the other evening in the year book from Washington, which, by the way, is one of our most valuable publications. Now Mr. Morton says that we exported over $600,000,000 of agricultural products into the old country last year, mostly to London, but out of all that we exported there were only about 2,000 tons of butter. The little kingdom of Denmark referred to has sent to London markets this past year over 50,000 tons of butter. Now we can send butter to London just as well as they can send it from Denmark; what is the secret of it, why is so much more shipped from Denmark? The simple fact is that the Danes surpass the world in making a nice article of butter. If we could instruct our dairymen to study dairying as it is done in Denmark, and furnish butter that we could send to New York and London, and get as much money for it as the Danes do, there would be no danger of over-production. I submit that in all our dairy work we should be anxious to impress upon the farmers and their wives and the creamery operators not only that they shall make butter but that they shall make that special article of butter which the market calls for, and is willing to pay for.

DR. TWITCHELL.

MR. PRESIDENT, GENTLEMEN OF THE BOARD: What I had in mind was just a thought in connection with, perhaps in addition to, what our cattle commissioners have said to us this afternoon. Having spent some little time among the farmers in other states I have this winter been particularly impressed with their appreciation of the quality of Maine stock. It has shown itself more than ever before, and naturally so, because of the somewhat excited state of mind prevailing in those states and the feeling which they have that Maine has passed through all that and settled down to business, and that our stock is comparatively free from tuberculosis. So that, wherever I have been, there has been an urgent call for information in regard to Maine cows. At the same time I have noticed a decided change of sentiment, in Massachusetts especially, upon the question of tuberculin and its use. Where a year ago there was very active opposition, there is to-day a feeling of sympathy and a desire for its use. I have in mind a number of dairymen, milk producers as well as butter-makers, who have sought the use of tuberculin as a business investment, and I have been forced to the conclusion, as I have talked with them and learned the results obtained by them and by others interested in that question, that that is something which must claim our attention in the State of Maine in the near future. To-day it is impossible for us to sell a creature outside of the State unless it stands the test. I think Brother Briggs and other breeders have had calls for cattle, and in every case that I know of the statement was made, "We cannot accept your animal unless it has been tested;" showing that not only in conformity to law but in conformity to public opinion the farmers of other states are beginning to put an estimate on the tuberculin test. And it seems to me that this Board might urge upon the farmers a larger measure of confidence in the use of tuberculin as a means of protection, also as a business investment. The young animal which stands the test is stamped on the market as an animal of merit; we have given it the best seal that we possibly can. And yet in urging this we call for a large increase of labor and expenditure of money. I know of breeders in this State who for their own protection at their own expense have had their animals tested; and I think the time will come when through an appropriation sufficient for the purpose our milk producers will feel to call upon our cattle commissioners for the use of this test and will accept its results as conclusive.

Mr. SKOLFIELD.

In regard to the matter of supplying hotels with produce, of which we were talking a few moments ago, I was talking with Mr. Ricker of the Poland Spring House and I asked him as to the amount paid by that house for farm products, especially eggs, butter and milk (with some other, what I might call minor, products) and he said $40,000 a year. I asked him what proportion of those products were furnished by the farmers of Maine, and he said, "We have to get all our eggs and poultry and a large portion of our butter from Boston." Then he qualified it and said, "There are two or three men in Poland and New Gloucester whom I can rely on, and who make a contract to furnish me with so many eggs on such and such days, and I know they are coming and can count on them." If the farmers of the county would only furnish him with these products, he said, he would rather pay them the profit which he is paying to somebody else. Whereas they are shipping their products to Boston and the dealers are sending them back to him. There is a groceryman in Augusta who has been trying for the last three years to find a farmer who would furnish him ten head of poultry a day. Several have made a contract with him, but before two months had passed they dropped out.

Mr. DEERING.

I want to say one word in relation to stock growing. I believe that the State of Maine has the greatest opportunity at the present time that it has seen for twenty years in breeding stock. For instance we see before us that Massachusetts must at least kill thirty-five per cent of her cows, that is stated by her own cattle commissioners. Connecticut must kill a large proportion of hers. Rhode Island has hardly waked up yet to a realizing sense of her duty, but she has commenced to kill. Vermont is in it; and New Hampshire, we do not know how much, but we understand that the southern part is affected. Now if the Maine farmers will catch on to this and will raise cows, commencing now, they will have an opportunity to sell all they raise within the next five years for a good price, the best price they have ever seen. I want to know what better opportunity there is for the Maine farmers than this. We want to impress it upon the farmers that they have the best opportunity for stock raising that they have had for years.

Mr. McKEEN.

The idea of these talks from the members was originated at our meeting last year, and it proved to be very helpful to our work during the year. The suggestions that we have received this afternoon are of great value and I assure the members of the Board that they will be considered by myself and the executive committee in every possible manner.

I also want to call your attention to the fact that the doings of the Board at this Annual Meeting amount to something; that the work of the Board in the two days session last year constituted sixty-eight pages of our annual report, and very much of that matter is as valuable as any part of the book. I wish to congratulate the Board on the work we are doing at our Annual Meetings.

Dr. BAILEY.

Something has occurred to me in relation to private gentlemen testing their herds. We all know D. W. Clark of Portland, one of our prominent business men. He has a herd of Guernseys, and recently he went to Connecticut and selected six cows to increase his herd. The owner of the herd from which he selected them said he had never had any trouble with tuberculosis. Mr. Clark came to me and asked me what would be required in order to get them into Maine, and I told him he would be obliged to have those cows tested and for his own safety he had better do it before he paid his money. He finally required the owner to test those cows before he would settle for them, and Dr. Gardner made the test, and every one of them were diseased. Mr. Clark saved paying his money for diseased cows and we were saved from getting them into Maine.

From 150 to 200 cows per week are shipped out of Maine, and the drovers who are buying those cows are taking the best animals into Massachusetts. They will buy only young animals. They pick every cow that is desirable ,and the farmers for the $5.00 extra that they can get for that cow are selling the one which would give as much milk as the two right beside her. I think the farmers are very short sighted in doing this. It is hurting us more than it is doing us good. The farmers must go to raising cows, as the best cows are going out of Maine.

Mr. ATHERTON.

Mr. President, Gentlemen of the Board: I have but very little to say to you. I have listened with a great deal of interest to the remarks from the gentlemen of the different counties. I was thinking over the other day what lines of work I might suggest if I were here to-day and had an opportunity to suggest anything to the Board (which I do not feel competent to do) and there were three things which came to my mind which I thought ought to be brought to the front. The first is stock breeding, which your brother from Androscoggin introduced, and which I would like to emphasize somewhat. The second subject was the improvement of our pastures so that we may keep more stock, and I will say right here that I have this fall improved from fifteen to twenty acres, making it of more than double value to me, I think. The third subject was the improvement of our country roads; we all know that the better roads we have the better facilities the farmers will have for getting their products to market.

The subject that was of most importance, in my mind, was stock breeding, which I think the farmers have neglected too much. I know of many towns and cities where I am pretty sure the stock has been deteriorating from the want of a good male animal. I was in a fine barn in Augusta the other day, and there was no stock there that ought to be kept there, either male or female.

Two years ago I had a fine, two-year-old male Jersey animal but I sold him to a gentleman in Gardiner, as I had young children at that time and was afraid to keep an animal of that kind in my herd. Since then I could not improve the cows that I had without driving too far, and there are a great many towns like mine, they keep only scrub animals. My idea is that every city and town in this State ought to keep the best that they can get. Mr. Cobb of Vassalboro keeps a very fine animal, an animal for which I think he paid $400, and that animal has left its stamp upon his herd; wherever animals have gone out from that herd the dairy interests have been improved. I do not know that I would advocate the purchasing of fancy stock by the State, but I think our State ought to take more pride in its stock, and do something to improve it. Canada does more in the line of breeding than we do. I wanted to improve my sheep by purchasing a full blood Oxford Down buck, and I went up to Mr. Charles Hilton's and he showed me a book which contained the names of a number of breeders in Canada. There was not a man in Canada breeding grade stock; they were all breeding the very best. I found that when Mr. Hilton, or any other breeder in the State, wanted to improve his stock he sent to Canada. And this is frequently the case with horses. I think Maine is not doing what she ought in keeping the best animals, whether Jersey, Holstein or Hereford. I believe in dairying, and if I am not able to keep a representative bull of the Jersey variety, I wish that my town would keep one, so that such an animal could be reached. You know how it is with horses. If men who are breeding horses for speed and style have a mare that will trot in 2.20 they would not think of breeding from a sire that could only travel in three minutes and had no style. And yet farmers will allow themselves to breed from bulls whose throats ought to be cut and their bodies thrown into the Kennebec river.

MR. VINTON.

No man like Mr. Cobb can put such a bull as that on his farm and let his neighbors bring their cows there unless he charges a respectable fee; and the farmers, as has been said here to-day, will not pay that fee, as they would rather commit the folly of going to some scrub animal, where they can get the use of the bull for nothing. But there is one way in which that difficulty can be obviated. Most of our towns have town farms, the cattle on which belong to the farmers, and I submit that it would be a good action if a town would put an article into its warrant, to see if the selectmen should not be instructed to put upon the town farm a good, thoroughbred bull, to which the farmers of the town may take their cows with a very little fee.

MR. POPE.

Mr. PRESIDENT: The stock question is out of my line; but I understand that there was a little action taken here last night which affected me somewhat. I was a little surprised to learn that the Board voted to expend no more money with us at our Annual Pomological Meeting. It has been the practice for a number of years, as you all know, to have a Joint Meeting in the winter. It has been your practice to have an Annual Meeting for dairying, to make a specialty of that, and I supposed it would be nothing more than proper, as orcharding is one of the leading interests of the State, that you should have an Annual Meeting, and spend considerable money, for orcharding; and to do that, your Secretary has said, "You understand the selection of these speakers better than I do, therefore you do the selecting and I will help you pay the bills." Now I understand that this is to be discontinued, I do not know for what cause, whether you thought we were not able to select the speakers, or whether you thought what speaking was done in that line, should be done by a few parties in the State at the Institutes instead of making a large meeting only for fruit-growing. But it seems to me that you have made a mistake here. It seems as though the money which you expend in that line could be as well expended in a special meeting which shall give those especially interested in this one branch a chance to attend that and that only, as it could be in any other way; but I will not take up the time on that, because it is too late, the action has already been taken.

Some years ago the thought came up of using the stereopticon to illustrate some of the lectures at our Institutes, and I was very much pleased with the idea, for I thought that could be made an auxiliary which would be very interesting; because you all know that if you pick up a magazine the illustrated articles are the ones that you read first, and you can present in a picture what you cannot present in any other way. Our Secretary, Mr. McKeen, had a chance to get a stereopticon at the State College, instead of purchasing one, and what little that has been used it has met with success. Now I speak of this in connection with something else which I wish to call up, which is this: Is it practicable to hold an Institute during the summer, in the form of a field meeting, and illustrate our talk with object lessons? How much easier it would be, for instance, to go to the orchard, or the fruit garden, or the vegetable garden, and talk with the objects right before us, illustrating with experiments, than it is to talk to the people in the evening or in the winter away from the farm. If I could take parties, for instance, directly to my orchard when it is in bearing or in full blossom, and show the full operations there, the work of the spraying pump and everything of that kind, and give those object lessons, how much more people would carry away with them than they would by simply hearing a little talk about it. I do not know that there is anything practicable about this, but if it could be done it would seem to me to be a good thing.

Mr. STRAW—Does Mr. Pope have implicit confidence in the use of the spraying apparatus?

Mr. POPE—While we cannot destroy all of the fungi or all of the insects, we can in a large measure prevent the ravages of insects and diseases. We cannot completely eradicate these, we can hardly expect ever to do that; but I am willing to say that no progressive orchardist will be without the spraying pump or its frequent use.

MR. VINTON.

I think Mr. Pope should be informed of the basis on which we came to the conclusion to cease paying the expenses of speakers at the Winter Pomological meeting. This custom of holding an Annual Winter Meeting with that society, assisting in paying the speakers, etc., sprang up some time in the past when you were weak in funds. But now that the appropriation is quite large, and the Pomological Society is stronger and on a better foundation, the Board thought that it would be better for each society to work separately, the Pomological Society holding its Winter Meeting by itself, and we going on with our work in pomological matters elsewhere, as well. It seemed to be no more proper for the Board of Agriculture to hold a meeting with the Pomological Society and pay for the speakers, than for the Pomological Society to hold a Joint Dairy Meeting with the Board and help us pay our speakers. Both are strong enough to do their own work.

MR. POPE.

What I claimed was that you could spend your money for pomological work more profitably in helping us in our Winter Meeting than in any other way. With your help we can get speakers which we could not afford otherwise, and at that time we would have a large number of people together who were particularly interested in fruit growing.

On motion of Mr. Straw, voted, that the motion made by the member from Penobscot and laid upon the table in the morning session be taken from the table and indefinitely postponed; and that the matter be left in the hands of the executive committee, assisted by the Secretary of the Board.

On motion of Mr. Dudley voted, that the thanks of this Board be extended to the Maine Central Railroad for reduced fares and to the Cony house for courtesies received.

On motion of Mr. Flint voted, that the thanks of the Board be extended to the President for his kindness and courtesy during the meeting.

On motion of Mr. Light voted to adjourn.

Adjourned.

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	C. E. Wheeler	Chesterville.
Androscoggin County	D. P. Field	Auburn	J. L. Lowell	Auburn	C. H. Gibbs	Livermore Falls.
Androscoggin, Durham Agricultural,	Wm. Stackpole	Durham	J. H. Williams	Durham	C. H. Bliss	Durham.
Aroostook County	Jonathan Benn	Hodgdon	Geo. F. Merritt	Houlton	Geo. F. Merritt	Houlton.
Aroostook, North	Cyrus Chase	Blaine	E. McGlauflin	S. Presque Isle	S. W. Duff	Presque Isle.
Cumberland County	W. H. Vinton	Gray	Chas. H. Leighton	Cumberland Mills	Fred D. Scammon	Gorham.
Cumberland, North	Richard Cook	Edes Falls	R. W. Fogg	Edes Falls	James Thomes	Harrison.
Cumberland Farmers' Club	C. A. Merrill	Cumberland Ctr.	M. W. Pearson	Cumberland Ctr.	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	S. S. Fuller	Bridgton	I. S. Webb	Bridgton	I. S. Webb	Bridgton.
Cumberland, New Gloucester and Danville	F. W. Winter	Upper Gloucester	L. L. Whitman	Upper Gloucester	Geo. C. Jordan	Upper Gloucester
Cumberland, Lake View Park	Arthur Dyer	Sebago	J. P. Fitch	East Sebago	J. P. Fitch	East Sebago.
Franklin County	S. M. Keep	Jay	J. C. Ames	Farmington	Geo. M. Currier	Farmington.
Franklin, North	T. B. Hunter	Strong	M. S. 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	H. J. Joy	Ellsworth.
Hancock, North	H. T. Silsby	Aurora	A. W. Silsby	Amherst	A. W. Silsby	Amherst.
Kennebec County	M. F. Norcross	Winthrop	Wm. G. Hunton	Readfield	Wm. A. Lord	Readfield.
Kennebec, South	David Given	South Windsor	F. H. Mooers	Pittston	J. S. Gray	South Windsor.
Kennebec, Pittston Ag'l Ass'n	C. C. Libby	East Pittston	G. R. Mansir	East Pittston	H. A. Clark	East Pittston.
Knox, North	E. H. Mero	Union	W. A. Bessey	Union	E. C. Gleason	Union.
Oxford County	J. A. Roberts	Norway	A. C. T. King	South Paris	A. C. T. King	South Paris.
Oxford, Riverside Park Association,	C. M. Wormell	Bethel	E. M. Walker	Bethel	E. M. Walker	Bethel.
Oxford, West	A. R. Jenness	Fryeburg	T. L. Eastman	Fryeburg	W. R. Tarbox	Fryeburg.
Oxford, Androscoggin Valley	Waldo Pettengill,	Rumford Falls	H. T. Tirrell	Canton	D. W. Goding	East Peru.
Oxford, North	Geo. O. Huse	Andover	John F. Talbot	Andover	Lewis C. Aken	Andover.
Penobscot County	C. E. 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	E. A. Reed	North Lee	L. W. Trask	Springfield	A. H. Lindsay	Carroll.
Penobscot and Aroostook	John Burnham	Sherman Mills	L. B. Rogers	Patten	R. D. Gardner	Patten.
Penobscot, East Eddington	M. E. Lynott.	East Eddington	H. W. Clewley	E. Eddington	J. H. Comins	East Eddington.
Penobscot, Orrington	A. 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	R. B. Shepherd	Skowhegan	H. A. Archer	Skowhegan	A. R. Bixby	Skowhegan.
Somerset, West	C. M. Hilton	Madison	Ben Moore	North Anson	Ben Moore	North Anson.
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	J. H. Cook	Unity.
Washington County	A. S. Farnsworth,	West Pembroke	H. F. Porter	Pembroke	N. S. Allen	Dennysville.
Washington, West	Jas. L. Bucknam,	Columbia Falls	E. F. Allen	Columbia Falls	F. L. Allen	Columbia Falls.
Washington, Central	J. K. Ames	Machias	W. H. Phinney.	Machias	M. Gardner	Machias.
Washington, North	Oscar Pike	Princeton	Joseph Lawler	Princeton	S. G. Spooner	Princeton.
York County	E. W. Staples	Biddeford	S. S. Andrews	Biddeford	Geo. H. Boothby,	Saco.
York, Buxton and Hollis	R. A. Smith	Hollis	J. B. Elden	Bar Mills	E. A. Hobson	West Buxton.
York, Ramshackle Park	C. A. Goodwin	Woodman's, N. H.	A. H. Davis	West Newfield	U. B. Thompson,	Maplewood.
York, Shapleigh and Acton	E. S. Lary	South Acton	Fred K. Bodwell,	Acton	H. A. Stanley	Shapleigh.
York, Ossipee Valley	Howard Brackett	Cornish	Jas. C. Ayer	Cornish	W. P. Perkins	Cornish.
York, Sanford A. and M. Association,	J. H. Makin	Springvale	A. W. Low	Springvale	I. A. Butler	Springvale.
York, North Berwick Agricultural	Nath'l Hobbs	North Berwick	Geo. W. Perkins,	North Berwick	J. B. Russell	North Berwick.

ANALYSIS OF EXHIBITION.

Name of Society.	Number of horses and colts.	Number of thoroughbred bulls and bull calves.	Number of thoroughbred cows, heifers and heifer calves.	Number of grade bulls and bull calves.	Number of grade cows, heifers and heifer calves.	Number of oxen and steers.	Number of animals for beef.	Number of cattle shown in herds.	Total number of neat stock.	Sheep.	Swine.	Poultry, (coops).
Androscoggin County	145	22	60	16	52	120	18	40	320	86	41	82
Androscoggin, Durham Agricultural	21	2	4	3	26	18	6	14	84	18	8	17
Aroostook County	46	3	20	1	16	-	-	14	40	46	10	37
Aroostook, North	50	3	8	8	10	6	-	-	35	39	-	26
Cumberland County	146	20	30	-	27	142	8	36	409	38	58	197
Cumberland, North	46	1	5	4	-	90	6	-	106	24	6	10
Cumberland Farmers' Club	28	3	1	-	23	50	4	12	121	5	4	27
Cumberland, Gray Park Association	44	2	38	4	29	66	4	-	113	22	20	9
Cumberland, Bridgton Farmers and Mechanics'	39	1	2	2	27	18	4	-	93	1	11	7
Cumberland, New Gloucester and Danville	32	3	11	3	39	22	2	27	139	22	2	6
Cumberland, Lake View Park	22	-	-	1	24	46	-	-	93	-	-	3
Franklin County	58	23	78	26	81	224	4	91	527	285	11	77
Franklin, North	41	5	27	2	28	120	9	36	236	62	9	19
Hancock County	74	2	1	3	18	30	6	-	134	12	30	10
Hancock Fair Association	16	4	4	1	21	16	-	-	83	37	17	24
Hancock, North	19	2	2	2	11	20	-	-	56	3	-	3
Kennebec County	110	8	23	-	71	184	16	30	332	50	36	33
Kennebec, South	88	1	7	3	8	88	5	15	127	1	-	6
Kennebec, Pittston Agricultural Association	14	2	11	1	8	52	4	15	93	12	14	8
Knox, North	60	10	33	8	19	44	12	45	231	36	18	19
Oxford County	19	41	27	-	65	82	6	48	265	49	46	55
Oxford, Riverside Park Association	45	5	18	9	32	50	4	21	139	24	24	3
Oxford, West	78	6	18	3	11	88	13	24	163	34	35	32
Oxford, Androscoggin Valley	47	11	98	8	30	62	6	22	284	27	15	21
Oxford, North	14	2	16	8	27	38	-	6	97	51	24	6
Penobscot County	15	3	2	3	14	-	-	6	43	6	7	10

Penobscot, Lee Union	41	2	6	2	9	14	-	74	33	-	2	8
Penobscot, West	66	14	37	4	67	70	10	20	222	48	1	62
Penobscot, North	40	4	12	1	10	18	8	-	53	-	11	-
Penobscot and Aroostook	38	1	8	4	8	8	-	-	67	60	2	10
Penobscot, East Eddington	11	-	-	2	10	2	-	-	14	13	10	7
Penobscot, Orrington	10	-	-	2	3	-	-	3	8	-	1	-
Piscataquis, East	27	-	-	-	9	-	-	-	9	2	-	3
Piscataquis, West	25	-	-	3	30	4	-	6	43	23	-	-
Sagadahoc County	36	30	104	-	95	58	8	-	350	85	15	120
Somerset, East	48	3	-	8	65	28	4	29	185	128	9	3
Somerset, Central	37	5	11	1	26	18	2	-	100	48	20	3
Somerset, West	36	1	2	1	24	60	3	3	91	16	1	3
Waldo County	20	5	3	-	1	34	4	-	40	25	10	7
Waldo and Penobscot	58	8	21	7	13	79	9	35	230	73	13	45
Waldo, North	9	3	18	-	-	19	4	6	50	4	16	3
Washington County	43	6	21	-	51	18	4	42	185	100	42	21
Washington, West	72	8	13	-	33	14	-	-	140	20	18	32
Washington, Central	40	4	10	-	19	8	-	-	41	13	15	20
Washington, North	30	1	-	3	14	6	-	15	69	10	11	10
York County	27	3	15	3	38	40	4	31	103	13	23	17
York, Buxton and Hollis	19	7	8	4	52	50	2	24	147	19	14	9
York, Ramshackle Park	29	8	10	4	6	28	10	5	100	4	-	4
York, Shapleigh and Acton	25	-	-	5	36	143	16	-	225	11	6	29
York, Ossipee Valley	16	5	34	-	9	116	8	16	204	6	11	4
York, Sanford A. and M. Association	22	2	16	-	3	120	4	-	167	28	25	23
York, North Berwick Agricultural	56	3	15	3	18	96	4	20	215	18	30	15

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 to horses for draft.
Androscoggin County	$33 00	$9 00	$10 00	$10 00	$9 00	$10 00	$12 00	$56 00	$45 00
Androscoggin, Durham Agricultural	-	5 00	-	-	-	5 00	-	12 00	6 00
Aroostook County	15 00	7 00	15 00	4 00	6 00	6 00	4 00	13 50	14 00
Aroostook, North	3 00	5 00	3 00	5 00	3 00	3 50	2 00	27 75	11 50
Cumberland County	49 00	36 00	-	-	19 00	-	-	19 00	40 00
Cumberland, North	-	-	-	-	-	-	-	2 50	52 00
Cumberland Farmers' Club	5 00	2 00	-	-	-	10 00	12 00	9 50	-
Cumberland, Gray Park Association	10 00	13 50	-	3 00	5 00	15 00	10 00	13 50	-
Cumberland, Bridgton Farmers' & Mechanics' Association	-	-	2 00	5 00	5 00	5 00	3 00	7 60	23 00
Cumberland, New Gloucester and Danville	-	-	5 00	-	3 00	8 00	5 00	9 00	3 00
Cumberland, Lake View Park	8 00	2 00	-	-	-	5 00	3 00	12 00	9 00
Franklin County	10 00	11 00	6 00	6 00	-	6 00	7 00	54 50	5 00
Franklin, North	-	-	5 00	4 50	-	3 50	3 50	27 20	-
Hancock County	9 00	6 00	-	-	2 00	-	-	21 00	-
Hancock Fair Association	13 00	6 00	8 00	-	-	13 00	-	-	14 00
Hancock, North	-	-	-	1 00	-	-	-	3 45	9 50
Kennebec County	17 00	10 00	5 00	9 00	15 00	10 00	6 00	21 00	12 00
Kennebec, South	10 26	2 28	-	-	2 01	3 42	-	6 19	5 32
Kennebec, Pittston Agricultural Association	2 00	-	2 00	-	4 00	-	-	9 00	-
Knox, North	5 00	7 00	7 50	5 00	4 50	5 00	4 00	42 00	9 50
Oxford County	33 00	15 00	-	-	-	35 00	-	54 00	69 00
Oxford, Riverside Park Association	10 00	9 00	-	-	-	-	-	13 92	38 00
Oxford, West	19 00	-	3 00	6 00	6 00	-	7 00	21 00	39 00
Oxford, Androscoggin Valley	23 00	15 00	-	-	-	20 00	6 00	31 00	13 00
Oxford, North	6 70	3 00	-	-	-	10 00	-	4 40	21 00
Penobscot County	-	-	11 00	16 00	-	7 00	-	4 50	-

Penobscot, Lee Union	-	-	-	1 75	-	1 50	-	4 75	5 00
Penobscot, West	5 00	9 00	7 00	5 00	3 00	10 00	5 00	22 00	15 00
Penobscot, North	3 50	2 00	3 50	2 50	3 50	4 50	-	24 00	3 50
Penobscot and Aroostook	3 00	6 00	6 00	6 00	-	1 00	-	13 50	-
Penobscot, East Eddington	-	-	-	2 00	-	3 00	-	3 50	-
Penobscot, Orrington	-	2 00	-	-	-	3 00	-	9 00	-
Piscataquis, East	-	-	-	2 00	2 50	2 50	5 00	5 50	10 00
Piscataquis, West	-	-	-	2 00	-	8 00	2 50	-	17 00
Sagadahoc County	14 00	5 00	-	5 00	8 00	15 00	-	24 00	-
Somerset, East	4 00	7 00	-	-	-	5 25	3 50	15 75	55 00
Somerset, Central	11 00	9 00	-	7 00	-	7 00	9 00	10 00	12 00
Somerset, West	-	-	-	-	-	-	-	-	12 00
Waldo County	3 00	4 50	2 00	-	-	-	-	7 00	5 00
Waldo and Penobscot	18 00	6 00	20 00	10 00	10 00	10 00	10 00	16 00	41 00
Waldo, North	50 00	3 00	9 00	3 00	6 00	-	-	15 00	3 00
Washington County	11 00	5 00	-	9 00	-	-	-	36 00	-
Washington, West	43 00	9 00	19 00	4 00	5 00	30 00	3 00	55 00	28 00
Washington, Central	6 00	6 00	6 00	6 00	-	10 00	-	49 00	18 00
Washington, North	8 00	5 00	-	5 00	-	-	-	18 00	20 00
York County	30 00	30 00	-	-	-	-	5 00	22 00	22 00
York, Buxton and Hollis	-	5 00	-	-	-	10 00	5 00	8 00	9 00
York, Ramshackle Park	5 00	10 00	-	10 00	7 00	9 00	4 90	28 00	5 00
York, Shapleigh and Acton	-	-	-	5 00	6 00	6 00	-	8 75	-
York, Ossipee Valley	17 00	8 00	-	-	-	-	8 00	28 00	-
York, Sanford A. and M. Association	5 00	4 00	-	-	3 00	8 00	-	9 00	-
York, North Berwick Agricultural	9 00	8 00	2 00	-	8 00	5 00	-	11 00	3 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	$63 00	$78 00	$76 00	$90 00	$18 00	$36 00	$34 00	$ 3 00	$19 00	$48 00	$76 00
Androscoggin, Durham Agricultural	-	-	9 00	25 00	7 50	-	10 00	12 00	10 00	-	18 00
Aroostook County	9 00	32 00	-	30 00	20 00	-	-	-	-	-	-
Aroostook, North	11 00	26 00	11 00	20 50	-	-	-	5 00	-	-	-
Cumberland County	78 00	38 00	-	95 00	25 00	90 00	46 00	-	18 00	-	127 00
Cumberland, North	5 00	12 00	10 00	-	-	6 00	12 00	11 00	6 00	10 00	78 00
Cumberland Farmers' Club	5 00	-	-	11 00	12 00	14 00	9 00	-	7 00	16 00	25 00
Cumberland, Gray Park Association	4 00	21 00	6 00	31 00	18 00	10 00	9 00	-	7 00	47 00	69 00
Cumberland, Bridgton F. and M. Association	3 00	4 00	3 00	18 00	-	6 00	3 00	3 00	5 00	5 00	16 00
Cumberland, New Gloucester and Danville	5 00	3 00	5 00	26 00	13 00	2 00	5 00	-	2 00	-	10 00
Cumberland, Lake View Park	-	-	2 00	9 50	-	-	4 00	-	2 00	-	12 00
Franklin County	43 50	59 00	21 00	32 75	32 00	12 50	13 00	-	9 00	157 00	21 50
Franklin, North	6 25	14 00	2 25	10 00	10 00	9 50	8 00	1 00	6 25	35 00	4 75
Hancock County	4 00	3 00	8 00	28 00	-	19 00	-	-	-	5 00	18 00
Hancock Fair Association	11 00	17 00	1 50	22 50	-	26 20	-	-	-	-	32 00
Hancock, North	1 00	1 00	25	2 35	-	3 10	3 00	-	-	-	4 50
Kennebec County	24 50	34 00	-	42 25	19 00	32 00	27 50	12 00	7 50	46 00	32 00
Kennebec, South	1 33	5 51	2 47	10 64	11 40	10 63	14 44	1 32	3 61	22 04	12 74
Kennebec, Pittston Agricultural Association	3 50	13 40	2 50	8 00	3 00	1 00	7 00	-	5 00	10 00	36 00
Knox, North	32 00	36 00	16 00	19 50	24 50	9 00	14 50	4 50	8 00	14 00	12 00
Oxford County	98 00	134 00	-	75 00	42 00	86 00	32 00	-	12 00	43 00	57 00
Oxford, Riverside Park Association	14 25	20 50	10 50	45 25	12 00	34 00	8 25	11 50	-	12 00	33 00
Oxford, West	21 00	36 00	7 00	16 00	16 00	24 00	44 00	8 50	11 00	48 00	38 00
Oxford, Androscoggin Valley	29 00	58 00	11 00	39 50	23 00	29 00	31 00	5 00	9 00	26 00	44 00
Oxford, North	6 00	7 80	6 00	2 70	3 00	27 75	5 00	3 00	5 00	5 00	24 00
Penobscot County	6 40	1 50	3 30	12 60	-	-					

Penobscot, Lee Union	1 50	4 50	2 00	3 50	–	4 50	–	–	–	–	2 50
Penobscot, West	49 00	54 25	8 50	23 25	12 00	27 00	–	–	10 00	5 00	20 00
Penobscot, North	4 00	11 25	1 00	13 00	–	10 00	1 75	–	3 00	–	2 00
Penobscot and Aroostook	3 00	–	3 00	5 00	–	6 50	–	–	–	–	–
Penobscot, East Eddington	–	–	2 00	8 00	–	1 00	–	–	–	–	–
Penobscot, Orrington	–	–	1 50	2 25	3 00	–	–	–	–	–	–
Piscataquis, East	–	–	–	4 50	–	–	–	–	–	–	–
Piscataquis, West	–	–	1 50	9 50	2 00	–	2 50	–	–	–	2 00
Sagadahoc County	64 00	160 25	–	108 75	50 00	65 00	25 00	–	28 00	52 00	79 00
Somerset, East	6 00	–	4 00	36 25	7 00	–	13 50	1 50	5 00	–	8 00
Somerset, Central	7 50	18 50	3 00	18 75	–	14 50	–	–	4 00	–	12 00
Somerset, West	–	–	–	–	–	–	–	–	–	–	7 00
Waldo County	10 00	3 50	–	3 00	–	25 00	5 00	2 00	5 00	–	–
Waldo and Penobscot	22 00	43 00	7 00	18 00	16 00	17 00	14 00	–	14 00	12 00	43 00
Waldo, North	12 00	20 50	–	–	6 00	21 50	–	–	9 00	14 00	–
Washington County	12 00	18 00	–	23 00	34 00	16 00	–	–	7 00	–	–
Washington, West	25 00	27 00	–	43 00	–	10 00	–	–	–	–	42 00
Washington, Central	10 50	13 00	–	19 00	–	16 00	–	–	–	–	–
Washington, North	3 00	–	8 00	16 00	–	10 00	–	–	–	–	10 00
York County	8 00	41 00	6 00	27 00	16 00	28 00	12 00	50 00	8 00	–	91 00
York, Buxton and Hollis	7 00	4 00	5 00	41 00	12 00	5 00	–	11 00	3 00	–	25 00
York, Ramshackle Park	–	6 00	10 00	6 00	5 00	13 00	–	8 00	8 00	9 00	–
York, Shapleigh and Acton	–	–	4 50	21 50	–	27 00	12 00	–	6 00	55 00	13 00
York, Ossipee Valley	22 00	59 00	–	22 00	15 00	48 00	26 00	5 00	8 00	57 00	32 00
York, Sanford A. and M. Association	7 00	25 00	–	5 00	–	7 00	3 00	–	3 00	37 00	16 00
York, North Berwick Agricultural	9 00	20 00	7 00	14 00	16 00	14 00	3 00	–	5 00	16 00	6 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	-	-	-	-	$869 85	-	-	-	-	-	-
Androscoggin County	$68 00	$67 00	$56 00	$74 00	57 00	$39 00	$13 50	$5 00	$93 50	$192 00	$1,400 00
Androscoggin, Durham Agricultural	13 00	6 50	14 25	17 60	10 15	3 00	6 85	-	10 00	-	200 85
Aroostook County	40 50	18 00	29 50	29 20	19 45	12 25	-	10 00	16 35	1 50	352 25
Aroostook, North	17 25	-	26 25	121 05	107 65	27 25	11 25	7 20	105 20	82 45	642 60
Cumberland County	35 00	9 00	137 50	40 50	30 00	19 50	19 50	-	53 50	87 25	1,111 75
Cumberland, North	10 00	3 00	10 00	13 50	15 00	5 00	-	-	12 00	-	273 00
Cumberland Farmers' Club	4 00	-	10 25	18 50	14 50	2 25	-	-	27 50	1 00	215 50
Cumberland, Gray Park Association	9 00	6 00	9 50	19 75	13 00	7 55	3 00	2 00	14 00	36 00	411 80
Cumberland, Bridgton Farmers and Mechanics'	1 00	5 00	-	8 40	11 00	2 25	2 25	-	23 10	65 45	234 45
Cumberland, New Gloucester and Danville	4 00	4 00	3 50	12 50	17 75	3 25	2 75	-	18 80	18 75	189 80
Cumberland, Lake View Park	-	-	1 00	6 70	5 30	1 00	-	-	8 45	-	90 95
Franklin County	130 00	7 50	44 54	13 85	38 00	24 75	6 25	-	20 20	9 85	801 69
Franklin, North	12 50	1 75	4 90	14 95	13 80	4 00	-	-	16 85	-	219 45
Hancock County	14 00	7 00	3 50	38 25	18 25	6 75	3 50	-	30 70	6 25	251 20
Hancock Fair Association	30 25	10 75	15 50	73 75	60 50	13 75	6 50	-	94 35	6 00	475 55
Hancock, North	75	-	1 50	20 35	10 60	4 00	1 85	-	17 10	16 00	101 30
Kennebec County	23 00	12 00	38 50	57 00	61 00	48 00	9 00	-	84 00	73 00	787 25
Kennebec, South	76	-	2 20	15 96	14 82	9 54	57	-	31 30	8 74	209 00
Kennebec, Pittston Agricultural Association	7 50	5 00	3 50	15 75	15 65	1 50	-	-	11 50	5 00	171 80
Knox, North	12 50	5 00	17 50	24 75	23 50	16 75	19 75	1 50	64 75	32 50	498 00
Oxford County	27 00	28 00	14 50	20 00	41 50	69 00	9 50	7 00	26 90	91 70	1,120 10
Oxford, Riverside Park Association	11 00	11 50	3 00	12 05	11 25	9 15	-	-	25 00	16 25	371 37
Oxford, West	18 00	16 00	5 00	45 45	-	30 70	-	15 50	48 18	12 00	561 33
Oxford, Androscoggin Valley	18 00	8 00	18 00	15 45	23 05	14 50	3 25	8 00	14 40	24 40	559 55
Oxford, North	13 00	5 00	6 00	8 00	7 00	7 20	2 00	10 00	27 00	-	225 55

Penobscot County	3 00	3 00	-	46 00	23 25	-	-	-	12 95	27 00	†167 50
Penobscot, Lee Union	-	1 00	2 00	6 00	3 00	1 50	-	-	5 50	-	50 50
Penobscot, West	18 50	3 00	37 50	30 60	35 70	31 00	4 50	2 50	122 70	30 40	605 90
Penobscot, North	-	5 00	-	6 50	12 00	8 00	50	-	36 70	1 00	162 70
Penobscot and Aroostook	5 50	6 00	2 25	3 50	9 50	7 00	-	-	13 25	-	100 00
Penobscot, East Eddington	4 50	2 00	2 50	17 25	10 00	5 25	1 00	-	8 75	3 00	75 75
Penobscot, Orrington	-	1 00	-	26 90	17 90	1 50	-	-	21 90	11 25	101 20
Piscataquis. East	1 50	-	1 50	7 75	2 00	1 90	-	-	-	30	46 95
Piscataquis, West	3 25	-	-	3 40	1 00	2 50	-	-	50	6 75	64 40
Sagadahoc County	21 50	21 00	99 75	150 00	97 50	53 00	2 00	-	85 75	321 54	1,555 04
Somerset, East	28 50	12 50	2 00	10 75	1 80	13 50	1 65	-	18 45	38 50	299 40
Somerset, Central	36 50	5 00	8 00	*	*	*	*	*	*	205 00	397 75
Somerset, West	-	-	-	-	-	-	-	-	-	-	19 00
Waldo County	8 00	3 00	7 00	30 75	7 75	-	-	-	13 00	5 00	149 50
Waldo and Penobscot	25 50	5 00	18 00	38 75	25 50	11 25	4 75	-	142 00	-	617 75
Waldo, North	6 50	1 75	3 50	22 30	4 50	8 25	22 25	-	88 35	-	329 40
Washington County	27 50	15 00	14 25	69 25	21 25	12 75	7 25	2 00	56 85	-	397 10
Washington, West	17 00	15 00	23 00	102 65	77 55	30 90	1 75	-	71 30	114 45	796 60
Washington, Central	13 00	10 00	13 00	65 75	20 30	7 50	2 70	-	71 50	10 00	373 25
Washington, North	7 00	11 00	10 00	21 15	23 50	7 90	-	-	40 00	-	223 55
York County	15 00	6 00	29 50	16 50	9 00	-	-	-	-	-	472 00
York, Buxton and Hollis	5 50	7 00	3 75	12 00	4 50	1 50	-	-	19 86	1 50	205 55
York, Ramshackle Park	1 00	-	1 00	10 00	2 00	-	-	-	30 00	-	187 90
York, Shapleigh and Acton	5 50	9 00	17 00	59 50	10 25	7 50	-	-	76 50	-	350 00
York, Ossipee Valley	3 00	9 00	3 00	12 00	27 90	2 50	-	-	22 30	-	434 70
York, Sanford A. and M. Association	11 00	18 00	16 00	17 00	15 00	10 00	3 00	-	30 80	-	252 80
York, North Berwick Agricultural	10 00	10 00	19 00	19 50	7 50	4 00	-	-	18 75	33 00	277 75

* Special dairy and grange premiums.

† Discount, 80%, $33.50.

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	$2,000 00	$100 00	$100 00	-	$ 521 00	$2,721 00	-	-	-	-	$200 00	-
Androscoggin County	235 73	39 35	-	$331 25	1,231 11	1,837 44	-	$830 00	$525 94	$2,070 54	1,000 00	$600 00
Androscoggin Durham Agricultural	-	-	48 00	77 50	583 76	709 26	$40 00	210 00	288 35	538 35	2,500 00	1,200 00
Aroostook County	118 38	36 00	262 72	45 00	281 39	743 49	-	175 00	216 24	743 49	200 00	517 72
Aroostook, North	181 14	67 45	-	417 00	1,251 63	1,917 22	139 24	1,085 00	155 66	2,022 50	4,000 00	2,700 00
Cumberland County	459 74	40 00	500 00	971 50	3,841 47	5,803 71	371 06	2,100 25	1,774 31	4,245 62	6,000 00	1,100 00
Cumberland, North	87 00	-	-	53 00	310 49	563 00	250 00	450 00	1,100 00	600 00	2,300 00	-
Cumberland Farmers' Club	97 96	4 00	-	261 25	613 99	977 20	-	525 00	476 47	1,001 47	4,500 00	450 00
Cumberland, Gray Park Association	159 79	-	-	521 25	1,078 35	1,759 39	1,200 00	875 00	315 00	2,390 00	9,000 00	2,535 00
Cumberland, Bridgton Farmers' & Mechanics'	31 81	309 40	36 40	27 00	-	404 61	-	-	-	96 26	350 00	-
Cumberland, New Gloucester and Danville	-	120 00	-	50 25	376 07	546 32	-	265 00	65 00	519 80	2,500 00	-
Cumberland, Lake View Park	80 27	-	-	78 50	470 40	629 17	45 00	309 50	108 40	553 35	1,400 00	130 00
Franklin County	194 00	740 00	-	343 50	2,329 34	3,606 84	200 00	847 00	182 00	2,068 69	4,000 00	-
Franklin, North	81 54	250 00	-	187 50	485 51	1,004 55	25 00	475 00	25 00	990 52	3,000 00	2,305 00
Hancock County	105 76	-	350 00	206 25	1,198 85	1,860 86	923 04	815 00	306 68	2,094 72	5,000 00	1,350 00
Hancock Fair Association	215 02	-	-	126 50	2,479 12	2,820 64	261 35	870 00	1,213 74	2,550 64	11,500 00	-
Hancock, North	105 76	30 00	-	-	315 32	345 32	-	-	211 45	312 75	32 57	-
Kennebec County	181 41	3 00	-	203 75	1,669 68	2,057 84	124 00	650 00	787 44	1,561 44	2,700 00	820 00
Kennebec, South	83 61	1 00	-	78 50	1,014 42	1,177 53	102 55	401 50	602 92	1,106 97	1,442 89	-
Kennebec, Pittston Agricultural Association	82 45	-	150 00	40 00	606 00	878 55	75 00	301 50	185 68	561 58	1,500 00	650 00
Knox, North	105 59	312 25	291 50	26 51	79 41	815 26	-	120 00	325 00	815 26	-	70 00
Oxford County	353 92	19 00	-	438 00	4,014 30	4,825 22	1,425 92	1,137 50	400 16	4,773 49	10,000 00	-
Oxford, Riverside Park Association	-	-	-	195 00	379 92	574 92	25 00	475 00	190 00	1,061 37	2,128 62	569 45
Oxford, West	133 85	61 00	-	350 00	500 00	2,658 55	1,500 00	841 00	275 37	3,520 22	7,500 00	2,000 00
Oxford, Androscoggin Valley	126 58	15 00	-	242 50	1,221 56	1,605 64	-	575 00	480 21	1,614 76	2,500 00	3,215 50
Oxford, North	80 95	1 50	-	147 50	742 44	832 20	67 00	397 50	244 40	938 25	-	-
Penobscot County	-	-	-	93 75	478 05	571 80	-	90 50	452 96	578 96	-	-

Penobscot, Lee Union	-	33 50	-	-	24 95	58 45	-	-	17 50	68 10	-	-
Penobscot, West	195 19	146 00	-	1,043 25	1,948 60	3,333 04	279 68	1,834 75	241 50	2,355 93	2,500 00	1,485 37
Penobscot, North	150 70	6 00	-	166 25	41 45	364 40	-	625 00	6 00	846 44	-	-
Penobscot and Aroostook	100 00	-	-	245 00	791 08	1,136 08	157 09	575 00	302 20	1,134 29	2,000 00	2,000 00
Penobscot, East Eddington	-	-	-	-	-	213 13	-	-	175 26	175 26	1,000 00	-
Penobscot, Orrington	-	4 00	.	46 50	560 36	610 86	224 82	175 00	82 50	631 02	-	-
Piscataquis, East	62 37	15 00	-	94 00	290 00	467 37	-	315 00	26 00	383 90	-	-
Piscataquis, West	11 10	35 00	-	-	21 45	67 55	-	-	27 86	27 86	-	37 97
Sagadahoc County	374 05	606 00	2200 00	658 25	2,535 57	6,373 87	1,004 54	1,392 50	3,391 57	6,373 87	5,000 00	1,723 62
Somerset, East	78 93	46 00	-	179 00	958 88	1,262 81	97 93	615 00	226 27	1,295 56	3,500 00	2,357 95
Somerset, Central	-	-	-	170 00	631 27	801 27	-	435 00	247 84	1,080 59	2,500 00	875 00
Somerset, West	-	91 50	-	70 00	54 60	216 10	-	190 00	26 10	216 10	-	31 75
Waldo County	96 03	-	-	139 00	356 02	591 05	50 00	323 50	111 75	637 50	3,500 00	-
Waldo and Penobscot	250 00	20 00	48 75	460 50	2,896 93	3,676 18	1,796 83	1,100 00	589 00	4,103 58	4,000 00	-
Waldo, North	78 82	25 00	-	64 25	-	591 15	-	340 00	174 34	843 74	-	252 59
Washington County	109 55	12 00	256 13	380 00	937 01	1,694 69	144 88	925 00	683 46	1,798 59	1,800 00	600 00
Washington, West	255 99	2 00	225 60	245 00	2,479 53	3,206 52	38 00	680 00	750 00	3,176 00	2,199 40	698 15
Washington, Central	169 88	8 00	-	264 10	837 00	1,278 98	-	600 00	427 07	1,400 32	-	1,100 00
Washington, North	136 71	-	-	259 00	862 00	1,257 71	50 00	460 75	1,207 71	1,257 71	3,000 00	1,600 00
York County	235 66	-	1000 00	716 00	1,266 56	3,218 22	150 00	1,844 50	718 22	3,212 00	7,000 00	7,000 00
York, Buxton and Hollis	111 00	5 00	700 00	200 00	1,245 28	2,261 28	-	486 00	1,140 23	1,626 23	3,106 00	1,042 95
York, Ramshackle Park	128 30	-	-	149 50	395 50	673 30	82 82	316 00	277 51	676 33	1,500 00	80 21
York, Shapleigh and Acton	124 24	219 00	60 00	-	46 23	449 47	-	-	36 14	386 14	1,000 00	-
York, Ossipee Valley	200 00	10 00	-	775 00	1,787 06	2,772 06	.	1,350 00	587 69	2,825 36	6,500 00	2,161 58
York, Sanford A. and M. Association	126 34	-	-	276 25	1,033 97	1,436 56	100 00	537 50	267 67	1,157 97	5,000 00	173 21
York, North Berwick Agricultural	134 80	10 00	-	541 00	1,178 04	1,863 84	-	1,025 00	863 91	1,888 91	8,000 00	5,776 41

REPORT OF PROCEEDINGS

OF

STATE DAIRY MEETING

HELD AT NORWAY, DECEMBER 5th and 6th, 1895.

Thursday A. M. Meeting called to order by President W. H. Vinton. Prayer by Rev. Miss Angel of Norway.

ADDRESS OF WELCOME.

By J. A. ROBERTS.

GENTLEMEN OF THE BOARD OF AGRICULTURE; LADIES AND GENTLEMEN: I am very glad this morning to extend the hand of welcome to you. I have no formal address to make to you, but simply extend to you at the opening of these exercises the hand of welcome. We have always in the past, been glad to have the Board of Agriculture meet with us. Its members have come here many times and we have been instructed by them. We have received from them many lessons, and hope that we have profited by them. I am glad to see with us to-day not only members of the Board, but representatives from our college. We call it our college as it was established especially in the interests of farming. I am glad that its representatives are willing to come here and give us instruction in the line of work in which we are engaged and I hope that in meeting them and learning of their work we shall draw nearer to our college and support it as one of our institutions. I am glad to see here to-day and I welcome you, people from all parts of the State who are interested in dairying. We are glad to have you with us to take part in these exercises. And I also am glad to see the people from the neighboring towns coming here. It shows an interest in the work; and I wish to assure the Board that the people in this western part of the State are intensely interested in this matter of dairying, and we want to know something in the line of advanced thought; we want to learn of the progress that is being made. And also we come here for the enthusiasm that we gain from these meetings. We get into the ruts and follow along in the old ways unless we do attend such gatherings as these, but we hope to gain inspiration and enthusiasm from these speakers and to profit by these meetings.

I am glad also to see here representatives of those merchants who make a specialty of selling dairy goods. We are glad to see you here, we are glad to see your machinery here. We learn much by it. We hope that you will have a pleasant time with us, and that it may not be unprofitable to you. And I hope, and have no doubt, that these exercises will be not only instructive but pleasant. You and I know how much better we can labor if we are interested in our work. If pleasure goes along with the work, the work is more successful. It is no use for a man to engage in dairying or any other work unless his heart is in it. But if he loves the work, if he has faith in it, if he believes that he shall be successful in it, you may be sure that he will be successful. On the other hand if he cares nothing about it, but merely takes up the work as a means of earning a little bread and butter he will not be among the most successful ones.

I wish to say to the Board of Agriculture and to the speakers here, that although in this section we are not devoted exclusively to dairying, the dairy interests are increasing. We are becoming more and more interested in dairying each year. We are seeing that in the line of dairy work lies our future hope as farmers, and we trust that the Board will be able to give us such instruction in this meeting, and will so enthuse us that we shall go forth when the meeting closes to-morrow with a determination that we will do better than we have done in the past. We all of us know that we do not do as much as we know how to do. As I said a moment ago, we get into the ruts and we are apt to follow those because it is so much easier. But I hope, as a member of this community, and one interested in dairying, doing something in that line myself, that we shall go from this meeting and test the thoughts advanced here. We cannot lie still and do nothing. If we do we shall be left behind. We must progress with other people who are progressing. These are days of sharp competition in all sorts of business, and we find competition just as sharp in our line of work as in any other. We must not be laggards or we shall be left out of the race. Without taking up further time I will close my remarks by saying that we hope you will all have a pleasant time on this occasion.

RESPONSE BY W. H. VINTON.

I suppose it is ordinarily expected that an address of welcome should be followed by something on our part in response, and I desire in a moment to call your attention to the place to which we are welcomed. We are thus heartily welcomed to Norway Village, of which you have seen something and heard more. I remember in the winter of 1836 that some of us in the little country schoolhouse which I attended, thought that we would start a grammar class, but we were immediately confronted with the fact that we had no text book. So one cold winter morning we harnessed the horse into the old yellow sleigh and came to Norway Village, and bought a half dozen copies of Campbell's Grammar, published by Asa Barton. At that time South Paris was the headquarters and metropolis of Oxford county, and had been ever since 1805. But with all its consequence it could not afford a school boy the little Campbell's Grammar which he needed, and there was not another place in all the western part of the State outside of Portland where that book could be purchased, except at the little book store in Norway Village, kept by William E. Goodenough, and I see that to-day after the lapse of sixty years the building still stands and looks just as it did then. Then the wool which grew upon the flocks in all the barns, came to Norway Village to be carded in the carding mill of Horatio B. Cole, and the cloth was woven in the kitchens by the wives and daughters of the farmers and brought to Norway Village to be dressed and fulled. That was Norway Village sixty years ago, and from that time down to this day, it seems to me that Norway has maintained its supremacy as the leading village of Oxford county. You have been severely troubled by fire. Many years ago some of the largest stores and dwelling houses were burned, and latterly this terrible baptism of fire which you have had, destroyed nearly all the business part of the town. But as we walk abroad and discover the recuperative energies of the people, we marvel. Some of the members of the Board have come to me and expressed great surprise at finding such a place as this. I take it for granted from what they say that they thought they were coming into some sort of a wilderness, the home of the Oxford bear. But they find a village which I think is without a parallel in the western part of the State, with its factories, its woman in the ministry, and its electric cars in the streets. And only yesterday I read in a paper that a proposition is now to be submitted that the steam cars that run to Norway, shall also be run by electricity, the first proposition of the kind to be submitted anywhere in the State of Maine.

To such a place we are welcomed to-day. On the other hand who are those who are welcomed here? The State Board of Agriculture that has in its keeping the great agricultural interests of an agricultural people. I wish to magnify as far as I can the calling of the farmer, so long neglected. There are other avocations that could cease to exist and the world would go on and scarcely miss them; but if the agriculture of the world should cease to exist for any appreciable time, the race the world over would relapse into barbarism and death. This is an avocation from which almost no paupers come to the poor house, no criminals to the jails, and more than that, an avocation from which no names come, to any appreciable degree, to swell the long list of those who figure in our courts of insolvency. The list is increasing, and they come from every calling except that of the farmer. But I submit to you if in all the list you discover any farmers. The farmers with all the disadvantages they have had have lived, and live to-day. The calling of the farmer has never had its proper standing in the legislation of the State or nation, but we stand here to say that now at last the farmers of the State and nation are beginning to take their proper place, and are speaking with a voice which it is not quite safe longer to neglect to hear. The Maine Board of Agriculture does not bring here to-day all the interests it has in charge, but only one of its departments, the dairy department, which is the leading and controlling interest to-day in Maine.

The dairy department is one in which is crowded more energy, vitality and active competition than in any other department. The first State Dairy Meeting that was held in the State was held in Winthrop.* It was an excellent meeting; Ex-Governor Hoard was there. They had an exhibit, and showed as an aid to dairying one little insignificant machine, only one. That was half a dozen years ago. Now compare that with what you have seen and what you will see as this meeting goes on, and you will begin to realize how machinery is coming to the aid of the dairy business. Half a dozen years ago one little insignificant machine, and to-day all this multiplicity of machinery with this power to run it, not of steam or electricity, but a product of the farm.

This is the industry that we bring here for you to consider, and into which all the people of the State are requested to enter as a safe business, as the leading business, as the profitable business of farming. Thus, Mr. Roberts, we will sit down here with you and confer and take counsel together, and that our meeting will be timely, profitable and interesting cannot admit of a doubt.

* The first Dairy Meeting held by the Maine Board of Agriculture was held at Oakland on November 20, 1888. A full report of this meeting will be found on page fifty of Agriculture of Maine for that year.

OUR DAIRY INTERESTS.

By Prof. G. M. GOWELL.

MR. CHAIRMAN, LADIES AND GENTLEMEN: I hardly know how to talk to you this morning, and in fact I have no address, I haven't anything prepared that treats especially upon any particular line of our dairy work. It has been customary since these dairy meetings have been held to review the work that has been done, and to consider our standing; to consider something of what the outlook is, and what our future lines of work should be. And that is about what I propose to talk about this morning; not to treat of any subject in any particular way, or as a specialty.

I was interested in the remarks of the chairman, particularly when he spoke of the advance of the dairy interests. Now this conference is called together here simply because there is a special industry in this State that requires a meeting to be called together of people that are directly interested in it, that they may confer together and consider the industry and those particular phases of it in which they require instruction. This meeting is really an educational appliance of the State in its Department of Agriculture. We have come here as cattle breeders, as cattle feeders, as producers of milk, as manufacturers of butter and cheese, to consider whether we are doing the best we can, and to learn from association with our fellows what the best methods are, and to come in contact with each other. These individuals have come together from different sections and localities, and I would like to review the work that has been done in the line of dairying, and it is particularly proper that we should do this. In attempting to compare the work of the year that has just closed, with the work that has been done previously, I find that there is a great lack of data. We have no perfected organization; the meeting is called together, but it is simply in the hands of the Secretary of the Board of Agriculture, there is no organization.

I wanted to know the number of creameries in our State, the volume of the work that was being done, to how great an importance our dairy industry had grown, how many cows there were in the State, the average product of those cows, the money derived from those cows on an average, and how many individuals were engaged in the industry. But I could not even learn where the creameries and cheese factories in the State of Maine were located, simply because we have no organization that places in the hands of any individual this data. I have talked to you before about the desirability of the organization of a State Dairyman's Association where we can enroll ourselves as members of this association and work together hand to hand, contributing the information that each of us possesses for the benefit of the whole. I have learned from diligent inquiry that there are something like sixty creameries in the State, I do not know how many more. Is it not desirable that we should have this information furnished in some form? You know the work that has been done during this past year. You know how certain parties have come into certain sections and talked to the people about the great profits that are being derived from dairying in certain sections, and they have pictured the dairying business as an exceedingly profitable business. We do not claim that; we simply claim that it is one of the best avenues through which the farmer can dispose of the crops which he raises on his farm, that it only brings reasonable returns. We are thankful that it does not bring unreasonable returns for the reason that were it so profitable, men in other lines would engage in it and would soon control the interest in such a way that the farmer would lose his independence. It only brings reasonable returns, but certain individuals have presented in certain localities claims that the average incomes were something like sixty, seventy or eighty dollars per cow, and represented sixty dollars as average work. We know that those figures are simply the results of experts under unusually favorable conditions, but individuals in those localities where the establishment of creameries was sought were induced to believe those statements. And how should they know better? What reason had they for not taking the statements of the promoters of these schemes? They were not informed simply because they had not taken pains to inform themselves by close communication with those parties who were engaged as dairymen, and they had not the average results of what good dairymen were doing. I believe for this very reason, for the protection of our people, we ought to have a Dairyman's Association established, that we may know in what particular ways the best work is being done, and the results obtained.

We have made considerable advance during the past year. The first public move that was made after our Dairy Conference last year was at the legislature, where an act was passed relating to the qualification of parties who were using the butter fat test. Parties were required to be competent to do that work and were required to pass an examination as to their qualification; and the apparatus was subject to scrutiny, with penalties attached. This was a right move. It was the first real move that has been made. Some thirty of our creamery operators have responded to that law and have passed their examinations, and had their apparatus subjected to test. So far, so good. But the law makers should go a step farther and place the testing of that milk under still closer surveillance. You know that the testing of the milk or cream at the creamery is only one-half of the test. The taking of the sample and the weighing of the product are other features that must be attended to, by further legislation, if not by the willing action of the operators.

Now while we are speaking of the testing of cream I want to call attention to some of our errors. While we have made wonderful advance and have seen dairying grow from an insignificant industry to the leading industry of the State, we have not advanced far enough yet. We are doing very good work, but not perfect work by any means; and I want to call your attention to the products that the dairyman contributes to the creamery. Very imperfect work is being done on the samples that are being taken of the cream or milk that is furnished by the patrons, simply because that work is intrusted to persons who are careless and untrained. The present method, by which the cream collectors take the samples and bring those samples to the creamery, and then turn the work over to a tester who is qualified and has shown that he is qualified, is almost a farce. Men are employed to drive through the country and collect from the farmers their cream and milk, and the sample is taken and turned over to an expert creamery operator. Now, no matter how well qualified the man in charge of the creamery may be, if the sample is not correctly taken, his work is a failure. We must have samples taken with more intelligence. It is useless for us to hire men, as cream collectors are usually hired, those who will work for the least money, and expect those men who are at work for those low wages to devote the care and intelligence to the taking of those samples which is necessary. It is impossible to expect them to do good work for us. In these cold storms, such a storm as to-day for instance, the cream gatherer is chilled, and does his work the quickest way he can. If he uses a tube, instead of putting it down slowly through the whole column of cream so that it may fill there and take a fair sample, and then drawing it up carefully, he is liable to drop it down about as quick as he can and get it out as quick as he can. Even if he had conscience enough to take the sample properly he would be in no condition to do so. When that incorrect sample is brought in and placed in the hands of the tester, no matter how good work he does, it is simply a farce. It is misleading. I can see no other way, except that the entire product of each individual be brought to the creamery separately and be tested by the creamery operator in his comfortable room, with his careful training. I can see no reason why this should not be done. I have talked this matter over with our creamery men and asked them what reason there was that each collector could not bring in the whole cream from each man separately, and do it without much more expense than he was subjected to when the whole mass was poured together. Some of them have claimed that it would be more work, that it was hardly practicable. But others have claimed that they could do it, and we have several parties in the State to-day that are collecting each patron's cream separately and bringing it in to the creamery. Thus, by having the whole work of sampling and testing in the hands of the creamery operator, if he is a conscientious and careful man with proper training, the test of the butter fat can be of very much value, where I believe at the present time it is not of as much value as it ought to be.

There is still another reason why each patron's cream should be brought to the creamery by itself. Where the cream is all turned into one large receptacle and brought to the creamery in one mass there may be milk or cream from certain patrons that will be off in condition, and it will trouble the operator to tell where that milk or cream is, to whom it belongs. But if each individual's cream was brought to the creamery separately, the operator would be able to detect the defective cream when he took off the covers from the cans. You know it requires but very little defective cream to injure the butter. If it comes to the creamery in bulk, no one can detect it; but if it comes in a separate can, it gives the operator every chance to detect it, and he can determine whether the cattle have been kept clean and properly cared for, and whether a proper amount of cleanliness has been observed in the care of the milk. This argument of itself is sufficient to cause us to do this. Yet creamery operators say that all this work increases the expense and they cannot afford to do it. But their butter when it gets into the wholesale and retail markets has to sell at a lower price than it would were a better product furnished. I wish to follow the thought a little further. The tendency has been, all the way along in our dairying, to extend the work. The Board of Agriculture, a dozen years ago, took up dairying as the line of work best adapted to our Maine farming, and sought to make that the leading industry because of the profit that would accrue from its practice. The tendency has been all the time to extend the business, and we have been losing sight of the fact that we are not making as good a quality of butter as we ought. I believe the time has gone by when it requires any argument to cause a man to engage in dairying, but the quality of the goods that are being produced in our State to-day is not as high as it ought to be. You remember at our Dairy Meeting last winter the butter expert scored many of the products rather low. When he was called upon the platform and questioned upon that, he told us why he found so little merit in the goods. He told us that these goods in the Boston market must sell at a low price because they were particularly off in flavor. Now this was not very acceptable to us, because we have prospered so well in our dairying, that we thought we were all right; and when we found that our goods were standing lower than those of Massachusetts, Vermont and Connecticut, we have hardly believed it. But our dairy expert told us that our goods were selling lower than those from any other state in New England, and we were forced to believe that something of this kind might be true, and we have thought very much about the cause of that low quality of butter we are producing. This was of so serious a character that it seemed to call for investigation. Our expert told us he believed it was largely the result of the peculiar foods we employed, that our feeding was different from the feeding in other sections. Why should it be so? Our pasturage is not different from the pasturage of other states in New England, we raise the same kinds of grasses, clover, red top, timothy, we raise the same kind of corn fodder for our silos, we have about the same climate, we know we have as good water, and we have the best dairy stock of any State we know of. We have a wonderful foundation in our Jerseys, the breed that produces the best butter of any known breed. We have a careful class of farmers, we buy the same grains from the same sources. Then why should Maine butter be selling for less than butter from other states? Why cannot we keep up? This question came home to me with much force. I really did not believe that there were any conditions that existed that we could not overcome, that were defeating our purposes. In company with Secretary McKeen I went up to Vermont, to those creameries where the best qualities of butter are produced, that sell at the best prices in Boston markets. We looked at the stock on the farms, at their pastures, studied their soil, the grasses that were growing in their fields, their winter feeds, and their methods. We went about among the dairymen, and we went through the creameries, and we studied the question from first to last as thoroughly as we could in seven or eight days time. We went to those creameries where the very best products were being made, and we found the same grasses that we have in Maine, the same soils and comparatively the same stock, but with a less amount of Jerseys. Though there were many excellent hurds, we found many that were inferior to ours in their butter producing capacity. We found they were feeding bran, corn meal and cotton seed meal in every instance. We had been told that silos and cotton seed meal were the very things that were defeating the farmer in Maine in obtaining the best quality of butter. But every one of those creameries that are producing the best qualities of butter allow their patrons to feed grains as their own judgment may dictate. In the Ryegate creamery in Vermont, when the price of cotton seed was low, the patrons were told that they must not feed too much; but that was the only instance.

The Vermont dairymen have been doing just about the same kind of work we have been doing here. When the change from the old shallow pan was made, and the deep cans were first introduced, the dairymen of Vermont and New Hampshire introduced them almost exclusively. The patrons all used that process. Within four or five years, since the centrifugal machines have been perfected, those deep cans have been put aside, and they are using, almost exclusively, the separator system. The milk is drawn to the creamery each morning, and is run through the separator. Then the creamery operator has that new cream in his keeping, from which to make butter. Under the old process, with the collecting of cream from the deep cans, twelve or twenty-four hours were required in the raising of the cream and an additional day in its collection; so that when the cream came into the possession of the creamery operator it was very far advanced in ripening if not in putrefaction. They found when they used the same deep setting system that we are using now, that they were making inferior butter. I do not know what forced them to make the change, whether the machinery agents beguiled them into it, or whether it was the result of dissatisfaction from the lower prices, but this is a fact; I was told that in Vermont there was scarcely a creamery but what was using the separator system. I do not say to you that better butter can be made by the separator system than by the shallow pan, or deep setting system. But the separator separates the fat from the milk when that milk is new. It places that cream in the hands of the creamery manager (who is a careful man, or ought to be) when it is very young. There has not been an opportunity for the planting in it of different ferments that may affect it. This, and the working of that butter at low temperatures, and the making of that butter before the cream has advanced very far in acidity, hugging down just as closely as possible to sweet cream, getting just a slight degree of acidity, are producing butter that sells at higher prices than we are getting to-day. Now I am not going to tell you that we have got to throw away the process that we are using. I do not believe that. We are using the deep setting can, process. Suppose we set that milk yesterday or the day before, and collect the cream this morning. We collect that cream from the farmer as soon as it is produced, and bring to the creamery manager young stock, close down to the cow. When we do that we shall give him fresh stock from which he can make a high quality of goods.

What are we doing? The cream gatherer goes about our State, in some places he gets the cream every day, which is right. In other places he collects it once in two or three days, and other places once a week. I am going to tell you, my friends, that we have but few creameries in the State where collections are made every day so that the cream is taken to the creamery within a few hours after it is taken from the cans. This cream is taken from the deep cans and placed in cans in the farmer's creamer and held there from one to seven days, and what is its condition? Additions are made to it from day to day; these additions as they are made tend to mix the mass and it commences to get acid, and finally it lobbers and comes in sour. I do not know how many creameries there are in this State into which the cream is brought in a condition for making the best quality of butter, but I presume very few. Most of the creamery operators have told me it was generally slightly acid, or pretty sour. Where was this acidity developed? It was developed under all these varying conditions, in the different farmer's creameries or sheds. or wherever they might have stored their cream cans. Now it is impossible for the most expert creamery man to make the best quality of goods from cream that has advanced very far in the process of ripening. High priced butter is not made from acid cream, but from new cream. The argument brought up against these frequent collections is that it will cost more. The cows are widely distributed; the cow population is so sparse that if the collections are made every day it will increase the cost of the butter so much that we canot afford to do it. Can we afford to allow the expense of collection to deter us from selling our butter at its actual value? For just so sure as we make butter from over-ripe and putrefied cream, just so surely we are forced to sell it in a lower priced market. I believe it is the duty of every farmer who is furnishing cream to a creamery to demand that the cream be collected every day, except Sunday, so that he may be furnishing the best quality of cream and the creamery man may be able to make the best quality of butter and give him the most money. Until we do this we can never compete with those places where they are using the separator. I do not believe it is necessary for us to employ a separator in order to make the best quality of butter, if we will only attend properly to our creamery cans and furnish fresh goods. There is much in favor of these separators that these agents will tell you about. The separator takes out all the dust that may have escaped the strainer, all the slime and albuminous substances, and furnishes the pure fat, diluted of course with a certain amount of the milk serum, or caseine, and water. The separator furnishes cleaner cream, but there is not difference enough to cause us to change our system. But until we do radically change these infrequent collections we shall surely fail, and shall surely keep the position we are occupying now.

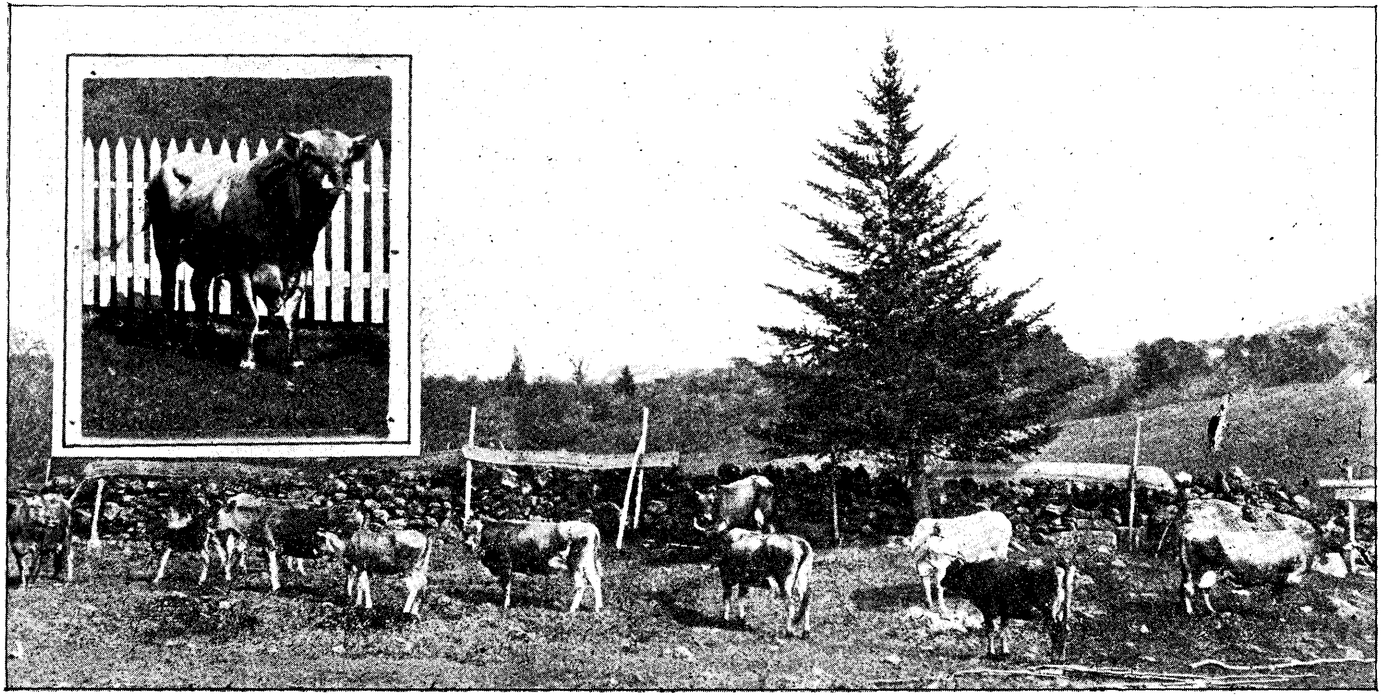
I am aware that it is not a pleasant place for a person to be in, to come before an audience and be fault finding; but it is of no use for us to come here and mutually admire each other, and then go home and think that we are doing well enough, for we are not. I know something about the poor work that is being done by the farmers. Many of the creamers are kept in sheds adjoining the barns, perhaps, and there the cream is taken off and handled. Now this is not right. We must provide ourselves with clean rooms, apart from any source of contamination; and care must be taken in regard to the surroundings of our cows. I want to illustrate this a little. Last week I asked a man in regard to his butter, whom I knew had harvested some 2,000 bushels of rutabaga turnips. I knew that he was making butter and selling it in a critical market, putting it into the hands of consumers. He told me that the butter seemed to be of a very nice quality. The patrons were pleased with it, he liked it very much himself. He was careful about feeding, but his cows were having a half bushel a day of the turnips, and yet the flavor of that butter was acceptable. His patrons did not discover that there was any difficulty. I asked him to make a little of that turnip butter and send it down here, as he was an expert dairyman. I got a reply from him saying, "I have been passing through the deep waters of trouble since I saw you. Those turnips commenced to ferment and steam, just as you told me you were afraid they would do, and that cold weather came on last week and I had to shut the barn up, and that air permeated all through the tie-up. I did not know that it would cause much trouble, but when I churned, and took the cover off the churn, the odor of the turnips saluted me, and I was sure that I had butter that was badly affected with the turnip flavor."

There are other odors also that the cows have to take into their system and cannot get rid of in any other way, so a part of it goes into the milk. Perhaps you might think, in the case of the turnips, that the flavor was absorbed by the milk setting in the cow tie-up. Not so. While that milk was setting there it was warm, it was cooling down and throwing off flavors, it could not fix flavors. The odor must have been inhaled by the cows. This turnip lesson may be rather a radical lesson but you can apply it in lesser degree to all the surroundings to which your cattle are subject.

There is another condition that must be met, as you are aware, in our stock. The cow is the foundation of our dairying. No matter what else we do we have got to have the right cow in order to do the right kind of work. Our dairy stock is gradually being elevated to a higher character; and I am glad to know that instead of our breeders and farmers being satisfied with using male animals that are simply pure bred animals, they are constantly demanding high capacity, so that they may increase the productive capacity of their cows, bringing them up to a standard of 300 pounds per year, and also improving the quality, as the quality of the butter comes from the quality of the cow. They are seeking for cows that will produce butter of such a color that they will not have to resort to artificial coloring. I do not object to artificial coloring, the market expects it, but I believe it to be a reasonable possibility that we can have stock of such a quality that we will have no need of this. We have lots of individual herds where this is the case.

I want to speak to the creamery men in particular, about the advantage of aeration. The aerator is simply a machine like the bellows. It is an arrangement of one or two bellows that pumps in pure air from out of doors and purifies the milk or cream by forcing through it the oxygen of the air and washing out the impurities. We are going to secure very much benefit in the future from this. It can wash out the impurities that have been fixed in the milk by absorption, but it cannot wash out anything that has passed into that milk and is in a state of solution there. How far can this be carried? Last winter at our dairy school the students took a pail of milk and hung it in a manure cellar over steaming manure, and it was allowed to remain there twenty-four hours, and then brought in. No one wanted to taste it, but we did taste it, and it was loaded, just as full as it could be, with the odors from that steaming horse manure, though nothing had fallen into it. We took that little machine, that cost twelve or fifteen dollars, and for eight minutes, air was pumped into that milk and came into contact with every particle of it. After it had been aerated eight minutes the milk was as pure as any milk I had ever tasted; nobody could detect that there was anything wrong with the flavor. We farmers and creamery men are going to make very much more use of the aerator in the future than we are making at the present time.

Adjourned to 1.30 P. M.



S. M. King, of South Paris, herd of A. J. C. C. Jerseys, headed by the noted bull, "Wachusett of Bolton."

RECENT INNOVATIONS IN CREAM RIPENING.

By Prof. H. W. CONN of Wesleyan University, Middletown, Conn.

MR. CHAIRMAN, LADIES AND GENTLEMEN: Every one is interested in good butter. Good butter interests both the consumer and the maker. It interests the consumer because it pleases his palate; it interests the maker because it fills his pocket. There are a great many factors concerned in the making of good butter. Our speaker of this morning has mentioned several of them; but your Secretary has asked me to talk to you upon one factor connected with the manufacture of good butter that was not dwelt upon this morning; a factor, moreover, which, until very recent times, has been somewhat neglected. Within the last few years the matter of cream ripening has been assuming each year, I might also say each month, more and more importance in the minds of dairymen. The reason for this is chiefly that the dairy interest is becoming more and more concentrated. When our butter was made in a thousand farm houses scattered all over the country, and made in small lots of ten or fifteen pounds, it mattered very little whether the cream was ripened properly or not. If farmer A chanced to have bad butter for a week or two he did not mind it much, and the matter of cream ripening did not receive very much attention. When, however, the cream is poured into a central creamery, and that creamery makes one, two or even ten thousand pounds of butter a day, it is a much more important matter whether the cream is ripened in such a way as to produce the best butter.

I remember my first introduction to the matter of cream ripening. Several years ago I chanced to be on a farm. I knew very little about dairy matters, although I was beginning to learn something. I went into the dairy and learned that the woman never churned the butter when the cream was sweet, and I asked her why. She did not quite know, that was the way she had been taught. But I continued questioning her to find out why it was that the cream was allowed to stand for one, two or three days before it was churned. She had no very good answer to give me; the chief reason was that her mother made butter that way. After a while she ventured the suggestion that somebody told her that the butter kept better if it were made after the cream had soured. That did not satisfy me very well, and it appeared to me that the process of cream ripening was a matter which deserved more study. From that time to this, I have been spending nearly all of my spare time in the study of matters connected with this cream ripening; and during the time this matter has come more to the attention of butter makers. I propose to give you an explanation of what cream ripening is, and how we can best regulate it. Some of the matter which I shall present will be old, and some of it you will find to be new, because it is new to knowledge.

The first question I want to ask is, Why do you ripen your cream? After having obtained the somewhat unsatisfactory answer from the person that I mentioned, I then spread the question around among dairymen and creamery men to see if any one else knew why they ripened their cream. Finally I obtained four answers, and in the years that I have been asking questions I have never obtained any more. One was the reason I have given, the cream is supposed when churned after souring to produce butter that will keep better. Whether that is true or not I do not know, nor do I think anybody in the world knows at the present time. Some of you think you know, but you will find others who think they know exactly the contrary. There is, in fact, no absolute knowledge as to that particular point.

The second reason is that the cream churns easier. There is no doubt about that. Some of you may have had the pleasure of trying to churn some sweet cream. You know you can churn it and churn it, perhaps for hours, without the cream turning into butter at all.

For a third reason I was told that the cream yielded a larger amount of butter, that more butter can be obtained from cream after it is ripened, than before. There seems to be a little doubt on this point. Nevertheless those two factors, the ease of churning and the amount of butter, can be obtained equally well by other processes than ripening cream. If you atttempt to churn sweet, separator, cream you have practically no difficulty in doing it. It is only gravity cream, that is difficult to churn when sweet. The cream obtained from the separator will churn readily and give practically the same yield in butter. So far as concerns the ease of churning, and the amount of butter obtained from a given amount of cream, the ripening process may be replaced by the centrifugal machines, and several other methods.

The fourth answer was that the butter obtained from the ripened cream had a better flavor than that obtained from the sweet cream; and here is the secret of the necessity for ripening cream. A flavor is obtained in the butter made from ripened cream that is not found in sweet cream butter. Sweet cream butter you may be familiar with, it tastes like sweet cream and not like butter. Butter has a peculiar flavor of its own. Now that peculiar flavor is what our speaker this morning mentioned as wanting in certain grades of Maine butter. That flavor is of the utmost importance to you. It gives you the price in the market over your neighbor's. Governor Hoard told me a year or two ago that in the West they consider the flavor of the butter means one-third of the price; and that means that without the flavor your butter will bring you only two-thirds the price it will bring with the proper flavor. Flavor is a very evanescent thing, it does not last long. It is quite noticeable at first, after a week or two it begins to be less noticeable and after a while it disappears entirely, and then you have butter that is passable but it is not fresh butter. Nevertheless, in spite of the fact that this peculiar, delicate flavor is so evanescent, it is this flavor that gives you the top two, three, four or five cents on the butter, and you know it is that two, three, four or five cents that makes the difference between success and failure in your creamery. If you lose that, your creamery is a failure; if you get it your creamery is a grand success. Now the ripening of the cream gives you the flavor and what we want to do this afternoon is to find out how the ripening gives you the flavor, why, and how you can in a measure control it.

Let me ask a second question, What is ripening cream? We have learned why it should be ripened, now what is ripening cream? Of course you all know the physical process. The cream is put into the vat and is allowed to stand at a temperature somewhere in the vicinity of sixty-five to seventy degrees for from twenty-four to forty-eight hours, according to circumstances. During that time it changes its character, it becomes sour, sometimes slightly sour, sometimes decidedly sour. It thickens up a little, and acquires a peculiar, delicate, pleasant sour taste and odor; a flavor and odor that I cannot describe to you, but you all recognize it. Those of you at all events who have had anything to do with the making of butter know the peculiar, pleasant flavor of the properly ripened cream. This process is a fermentation, just as truly as the fermentation of beer. It is, however, not produced by yeast, which is the cause of the fermentation of beer, but it is produced by another class of microscopic organisms which the world has become somewhat familiar with under the name of bacteria. Now every one in these modern days has heard of bacteria and has a little idea of what they are; and most of us are filled with a horror for bacteria and think they are something that we ought to avoid just as far as we can; that is not the whole story, however. It is true that there are some kinds of bacteria in the world that are our enemies. We call them disease germs. Some kinds get into our bodies, grow there and produce small-pox or measles or whooping cough, or some of the other diseases which we call infectious. Some kinds of bacteria do all this harm, but none of you refuse to have a cat in your house because a lion sometimes eats a man. No more should you be afraid of bacteria because there are one or two kinds that are your enemies. Farmers are beginning to understand that most bacteria are their best friends, that they could not carry on their farm processes without them. There is hardly a process on your farms from one end to the other in which the action of these little microscopic organisms does not come more or less into play. One of these processes is the one we are considering this afternoon, namely the ripening of cream.

The ripening of cream is a fermentation process produced by the growth of bacteria. I do not need to describe them very fully, I may simply say that they are little plants, incredibly small. Twenty-five thousand of them could stand in a row and not reach more than an inch in length. They are very simple in shape. Some are like billiard balls, some like lead pencils and some like cork screws; and after you have described them as resembling billiard balls, lead pencils and cork screws, you have said about all there is to be said about them. They are just minute organisms, visible to the microscopist, with these simple shapes. But they have two important characters. One is they can grow with most marvellous rapidity. They grow so fast that a single one in the course of twenty-four hours may have 16,000,000 children. Now, remembering that they can grow thus rapidly you can see that it is possible they may do something in the world, simply because they grow so fast. While they are growing they are eating, after their fashion, and producing great changes in the foods they use.

Where do the dairy bacteria come from? In the first place milk, which is the source of dairying, as it comes from the udder of the healthy cow should have no bacteria in it at all. The bacteria do not come from the cow, and nothing that you can feed to the cow by any possible means can make her secrete bacteria in her milk. This is a fact that it is of primary importance for you to understand. Nevertheless, in spite of that, by the time the milk has come to the milk pail, during the milking, it has become infested with bacteria to such an extent that there may be as many as 3,000,000 bacteria to every cubic inch of milk in the milk pail. That is rather an extreme number and not very common, but there ordinarily will be three or four hundred thousand or half a million or a million for every cubic inch. These bacteria are present, then, in the milk in your milk pail in these almost incredible numbers. How do they get there? They come from various sources, but the largest part are from the dirt on your cow. You know the condition in which you keep your cow, covered with filth, and you cannot milk her without shaking dirty hairs and all sorts of filth into the milk pail. That is the first and greatest source. Others again are already in your milk pail. None of you ever washes his milk pails clean. You think you do but you do not. No washing that you ever give them is sufficient to get the bacteria out of them. Ordinary boiling water poured from pail to pail washes out a few of them but leaves thousands of them clinging to the cracks. They are there all ready to begin their growth as soon as the milk comes into the pail. Some of them come from the hands and clothes of the milker. Many of them are lurking in the milk ducts, and then when the milk is drawn, it washes them out of the ducts and they get into the milk pail.

From these various sources, the milk becomes infested with these organisms. They are harmless, the most of them at least, and moreover they are beneficial; without them you could not get your butter flavor. Such, then, is the source of the organisms. Just as soon as the milk is drawn and they get into it they begin to grow and multiply with the rapidity that I have mentioned, and you can imagine how many there will be in the course of twenty-four hours in ordinary temperature. If you start with half a million you may not get sixteen million times half a million because they cannot grow quite so rapidly as that in cream, but there will be in the course of a day a very large number of them. During that growth they produce a great many changes in the cream. Some of them decompose the milk sugar, and turn it into lactic acid, and as a result the milk becomes sour. The souring of the milk, then, is simply the production in it of lactic acid from milk sugar, the lactic acid being produced there by the bacteria that are growing in it. I think we may say the great proportion, the majority, of the bacteria that are present in milk and cream in this way produce lactic acid, and sour the milk or cream. Others produce different effects. Some of them curdle the milk without turning it sour. I do not know how many of you have had that experience, but I doubt not some of you have found milk curdled, or lobbered, and yet tasting very pleasant. That is due to a kind of bacteria which produces rennet. There are certain kinds of bacteria which produce rennet and the rennet curdles the milk. These generally turn the milk alkaline, instead of acid. And then I might go on and mention the effects of many other kinds. Some turn the milk red. some turn it blue, some turn it pink, some turn it yellow, some make it frothy, and some cause it to bubble. All sorts of changes are produced by these different species if they get a chance to grow. These do not ordinarily occur in your dairy, but they may, if certain species get a chance to grow in the milk, for the proper length of time.

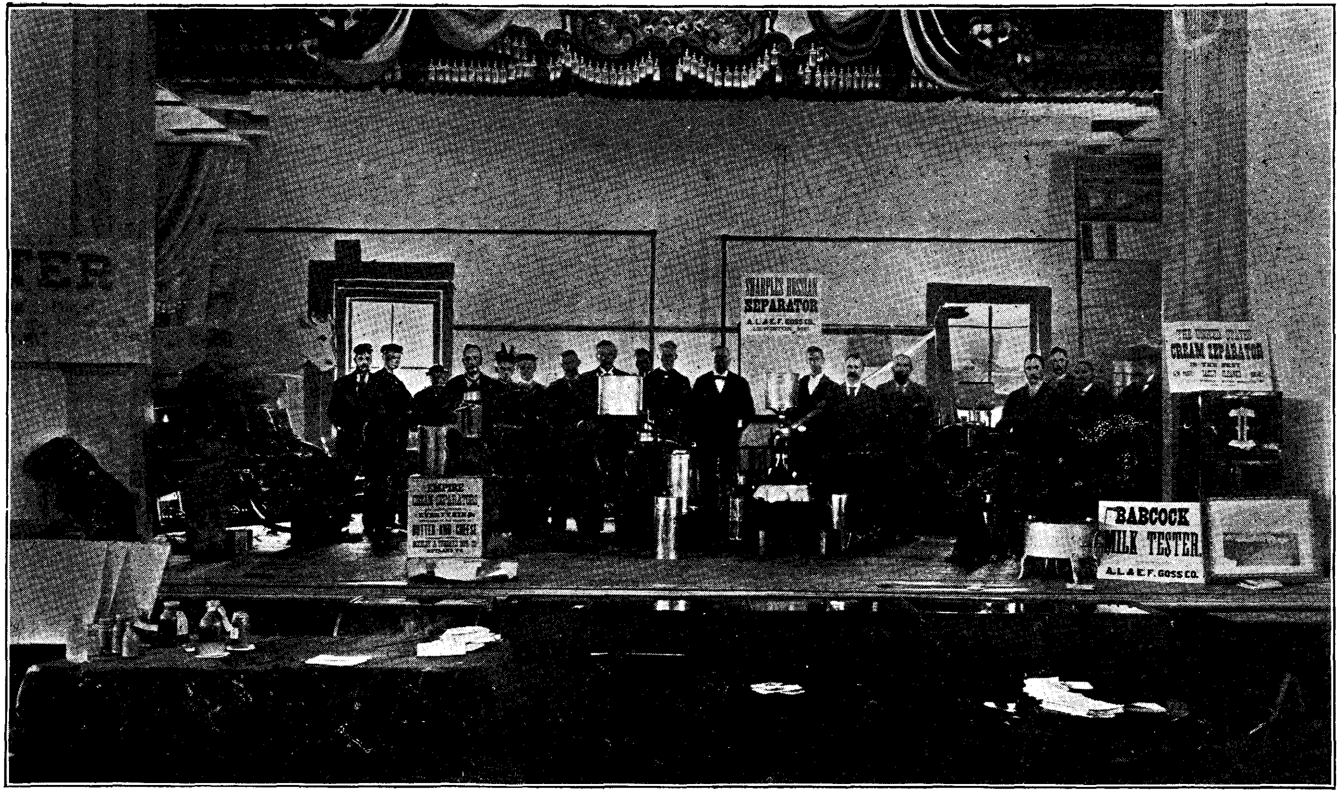
To this whole class of changes we may give one general characteristic; they all consist in what the chemist calls decomposition changes. That is, the bacteria growing in the cream pull apart the chemical ingredients; they break up the fat and the casein, and cause a chemical decomposition, reducing the casein, fat, albumen and other material into smaller particles. If you let that chemical decomposition go on long enough, these ingredients will be broken into smaller and smaller fragments, and finally the result is decay. You know the result of letting your cream ripen for two weeks, it becomes putrid. But if you let this decomposition begin, and do not let it go too far, then you have the first steps in the process of decomposition, and they are decidedly different from the subsequent steps. The final steps in this decomposition, give rise to all sorts of disagreeable odors. But the first steps produce not vile odors but pleasant odors, not disagreeable tastes but delightful tastes. If, therefore, you let your cream ripen for the proper length of time it will be filled with the first products of decomposition. These are pleasant to taste and smell, and as you churn your butter it is impregnated with the flavors, and this is your butter flavor. Butter flavor, then, is produced as the first steps in the process of cream decomposition. The first steps, mind you; you must not let the ripening go too far, because the second and the third and the subsequent steps are extremely disagreeable. The first steps are pleasant, and the proper cream ripening consists in churning the cream at the right point, when it has the proper flavors. Then your butter will have a good taste. You ask me why the process does not go far on after you have churned the cream, what becomes of the bacteria that are in the cream. A great many of them go off in the buttermilk, a great many are washed off with the water that is used, and some remain in the butter. But they do not grow in the butter. They do not subsequently produce any considerable effects in the butter.

What, then, is ripening cream? It is a fermentation produced by bacteria which come from various sources; and that fermentation consists simply in the chemical decomposition of the cream. The proper ripening consists in obtaining the proper decomposition products.

Now I take up a third topic, various types of cream ripening. I have spoken of the cream ripening as a process of decomposition, but there is more than one kind of decomposition in the world, and there is more than one kind of decomposition of cream. Some kinds of cream decomposition produce good results, some kinds produce decidedly bad results. Now these little bacteria of which I have spoken, although they are small, although they are simple in their appearance and hardly to be distinguished from each other under the microscope, really are just as different from each other as are the higher plants. We have different species of plants. No one would confuse the clover, and the oat, and the maple tree, and think that they ought to produce the same results when growing in the field. If you sow oats you do not expect to raise corn, because the plants are different in species. The same thing is true of these little microscopic organisms; they are simple, they are small, but they are just as distinct from each other as are the maple tree and the oat. Now it makes a great deal of difference whether you plant a maple tree or an oat, and it makes a great deal of difference whether your cream has in it one or another kind of bacteria. There are many kinds of bacteria which are lurking around your barns and dairy, clinging to your cows, and in the water with which you wash your cans, and that are clinging to your clothes. Nobody has any idea how many different kinds there are. I have myself found something like 150 different kinds of bacteria in the cream, of creameries in the vicinity of my own home. I cannot tell the exact number, but it is over 100, and they all produce different effects. Ordinarily the creamery operator knows nothing about it; but in my own experience I have taken one kind of bacteria by itself, and planted that in some cream to see what it would do, and then another species and planted that in cream to see what it would do. In this way I have planted fifty or sixty kinds to see what effect they would produce, and the effects produced were very different. Some give a delightful flavor to the cream and to the subsequent butter; some of them produce effects that are not appreciable at all, either to the taste or to the smell; and others again produce effects even from the first which every butter maker would want to steer clear of. Some of them make the cream bitter, and some make it sour; some of them will turn it yellow, and some will turn it blue; and some of them will give it a disagreeable, tainted smell and taste. Every butter maker knows the difficulty that he sometimes has in ripening cream. You all know that you occasionally find cream that after ripening has a bad taste. Now nearly all of those bad tastes that appear in your cream after ripening, have been found to be produced by certain kinds of bacteria. It makes then, a vast difference whether your cream happens to be ripened with one kind or with another kind of bacteria. It is not mere decomposition that you want, it is the right kind of decomposition, and you want to steer clear of the wrong kind of decomposition. What, then, does the butter maker want in his cream ripening? He wants bacteria. He wants them in his cream, but he wants the right kind. Not only so, but he wants a decided absence of the wrong kind. He wants in his cream either no bacteria except good ones, or good ones together with indifferent kinds that do not produce any results, or he needs at all events to have so many of the good ones present that the malign or injurious species do not get a chance to do much injury. If the butter maker happens to have cream that is filled, we will say, with one hundred million good bacteria to every one bad one, the one bad one is so lonesome that he doesn't get a chance to do much to the cream; so that it may be that you can make good butter even when you have some of the malign bacteria present. But you need either none of them or a very great preponderance of the proper kind.

Thus the different types of cream ripening, which every butter maker is familiar with, are due to the fact that the cream is ripened under the influence of a preponderance of different kinds of bacteria. Some kinds of bacteria produce good flavored cream and good flavored butter; other kinds produce bad flavored cream and bad flavored butter. I may state here that the great majority of the bacteria that are in cream are not injurious. Some of them produce bad flavors but most of them do not. I should say that of the sixty species that I myself have been studying, I have found eight or ten that produce bad tastes in butter; I have found eight or ten that produce a decidedly good flavor in the butter; but the most of them, the forty or so, do not have any particular effect on the butter. Remember, then, that there are a few species of bacteria that produce proper ripening and proper flavors, there are a few bad species ,and a host of indifferent kinds. Your butter maker, in making his butter, wants in his cream none of the bad ones, or a great proportion of the good ones.

How is he going to bring this about? That leads us to the fourth topic that I have to consider, how can we avoid the malign or injurious species of bacteria? Is there any means at our disposal by which we can keep them out of our cream? Now, unfortunately, our knowledge has not yet advanced to the point where this is exactly possible. With our present methods it is impossible to be absolutely sure that you avoid having in your cream the improper kinds of bacteria. Particularly is this true in the system of butter-making where it is concentrated in a creamery. The butter-maker of the creamery is absolutely helpless in the light of these facts. He can have no influence at all upon the kinds of bacteria that are present in the cream. He has to use whatever you bring in. Farmer A brings him some bacteria from a bad well, the water of which he used to clean his cans. Farmer B brings some from a pig pen in which he allowed his cows to wade. Farmer C brings bad bacteria from the dirt which was hanging from his cows. The cream is all dumped together, into a big vat, and you expect the butter-maker is going to ripen that cream properly, and get good results. He is dependent on you. He gets the bacteria which you bring to him from all sorts of sources. The butter maker cannot control the ripening of the cream rigidly after you have once furnished him with the bacteria. The cream will be ripened with whatever you give to him and he cannot help himself. Nor is the farmer himself much better off. The most of you err occasionally in furnishing to your butter-makers the improper kind of bacteria to produce the right kind of flavors, but you do it ignorantly. You do not know where you get the bad species nor where you get the good ones. The bacteria that get into your milk and hence into your cream come, as I have already pointed out, from many sources; some of them from the well water which you have used, some from your hands and clothes, and a vast quantity of them come from the manure on the cow. It may not be a pleasant thought that we are filling the milk with manure. It is easy to estimate, however, and it is found that the city of New York for instance, is consuming each day several hundred pounds of manure in the milk that is given



The stage in Opera House, Norway, as it appeared during the Dairy Conference, December 4, 5 and 6, 1895.

to it. Of course each quart of milk has a very small amount in it, but that small amount is enough to impregnate that milk with hundreds and thousands and millions of manure bacteria. Here then, is one source to be avoided. You groom your horses, keep them carefully clean. Did you ever hear of a groomed cow? Perhaps you have in these modern days on a modern nicely kept dairy farm, but most farmers do not groom their cows. But think of the difference! You groom your horse because it looks better. You do not groom your cow and yet you are eating the filth that accumulates upon her hairs. There should be decidedly a greater stress put upon cleanliness in connection with the cow than has ever been put upon cleanliness in connection with the horse. The one is a matter of aesthetics and the other a matter of health. I do not suppose any of you will go home and groom your cows, but I think you will remember what I have said, and possibly it may result in a little change somewhere.

Again, perhaps your cow is allowed to wade through a boggy swamp and the bacteria cling to her legs and udder, these you brush them off into the milk. Or perhaps the food you are giving is the source of bacteria. It is not the food the cow eats, for the cow does not secrete bacteria. But if you feed the cow on meadow hay that has been growing in a dirty meadow or near a swamp, when you stir up that hay you will fill the air with hay dust, and that dust contains bacteria in immense numbers, they float around through the air, drop into your milk pail and get on to your hands and clothes. So the food that you handle may affect the milk. You are the one that is to blame and not the cow. The bacteria come from your methods of handling the food, and not from the food the cow has eaten. Thus another source to which bad butter not infrequently can be traced, is the feeding of a certain kind of food; not because the food impregnates the butter, but because the bacteria associated with the food get into the air and drop into the milk, and are then taken to the creamery and used for ripening the cream. You do not know it, few people indeed do understand it. We are just beginning to find out the facts. It is impossible for the farmer to know where he errs. The trouble is here, and there, and elsewhere, and it requires a more strict observation than any of you probably have time to make, to pick out just where the source of the trouble is. The trouble is more common in certain seasons of the year than in others. For instance, you all know that when cows first go on to green grass feed, there is almost sure to be trouble with your butter. This is the time when the butter-maker knows positively that he must expect bad tastes, taints of one kind or another. One of the chief reasons is the effect of the green food upon the cow to produce diarrhoea, which gives a greater chance for the milk to become infected with manure and its bacteria. The bacteria from this source get into the cream more abundantly at this time than at other seasons.

There are other causes of bad flavors, coming from bacteria of improper kinds, but I cannot take the time to go further into the study of these various causes. There is no absolute remedy, and yet any one of you can very much benefit and can largely remove them, by the simple exercise of scrupulous cleanliness. The great secret of avoiding these mischievous bacteria is cleanliness; cleanliness in your own person, in your milk pails, with regard to the cow, and in the stall. Be careful that the hay you feed your cow does not fill the air with dust while you are milking. Feed the cow after you have finished milking, not before, if the conditions are such that the dust can pass from the cow over to the place where you are milking. Cleanliness in the dairy is also necessary. The water that you use in washing your milk cans must be pure. If you apply these general principles of cleanliness everywhere, from beginning to end, you will find these difficulties are less and less noticeable. And if you apply them with strict care you will probably find that the trouble that you have with your cream ever and anon, begins to disappear, and the creamery is able to have a more uniform butter product. That is the greatest secret of dairying. The best creameries in this country have long since learned it, and as a rule they have a superintendent who visits the patrons' farms and dairies, and watches not only the food that they give the cows, which of course is an important thing, but watches other things, methods of feeding, methods of cleaning, methods of washing cans. He watches all of these phenomena connected with the dairy, and, so far as he can in his official capacity, institutes changes here and there, which cause a greater cleanliness. The superintendents of the best creameries, in this way, are having a control over their patrons and thus forcing the patrons to furnish them with cream not infected so frequently with the mischievous bacteria that come from filth. Remember that as a rule these mischievous organisms come from filth, and that cleanliness which avoids filth, will in large measure avoid them.

Now I may state here in passing that it is possible for the butter-maker, after he has received the cream filled with these organisms from various sources, to get rid of them if he desires to do so. There is a process of doing this which has been developed in the past two or three years known as pasteurization. It consists merely in heating the cream to a temperature of about 155 degrees and allowing it to remain at that temperature five or ten minutes and then cooling it. This temperature kills most of the bacteria, and it does not affect the taste of the cream if you do not let the temperature rise above that point. A higher temperature gives scalded cream, but if you do not let it rise above 155 degrees neither the taste nor the physical character of the cream is affected. It churns just as readily and apparently no effect is produced except that the bacteria are killed. So it is possible to get rid of the bacteria even after the cream has come to the creamery, but at the present time it is not very practicable. It is expensive, it means a new plant, it means more work and that commonly means the employment of another man in the creamery, for that reason the process of pasteurization has not yet been introduced very much into our creameries. Nevertheless, it is being introduced, and every year sees more and more pasteurization going on over this country. We find if we look through the West, which is the greatest dairy section of the country, here and there a creamery has introduced a pasteurizer and pasteurizes the cream, and in the future I think there is no question but that the process is to extend more and more. And you can readily see the reason for it, and the necessity for it. If you are going to furnish your butter-maker with filth bacteria it is easy enough to see that he ought to have some means of getting rid of them, this is possible even at the present time as we see, and the process is introduced in a small number of creameries, but is not extending very rapidly since it is expensive and troublesome.

Thus, then, we have the answer to the third problem, or as good an answer as we can give, how we can avoid the mischievous organisms which we wish to avoid. The answer is that in a large measure they can be avoided simply by the use of scrupulous cleanliness, for the mischievous, malign bacteria have their source in most cases in some form of filth, and scrupulous cleanliness which avoids filth will, to a great extent, avoid the mischievous organisms.

But this is not enough. Your butter-maker not only wants to be free from bad flavoring germs but he wants the good flavoring germs present. He not only wants to be sure that his cream does not contain bitter and foul tasting germs, but he wants to be sure that his cream does contain the kind of germs that produce the right flavor. And that leads us to the fourth question, How can we obtain the proper species of organisms? Now, at the present time that is simply a matter of luck. You take your cream and carry it to your creamery, and your butter-maker is obliged to depend upon anything that happens to be brought to him. If he is fortunate enough to have cream brought to him from places where some of these good kinds of bacteria abound, his cream will contain good kinds. But if the cream is brought from places that are infested with the injurious kinds, it will contain these kinds. Now there is no question but that one very great reason why butter made in one section of the country has a better flavor than butter made in another section of the country is the fact that one section of the country is infected with delicate, fine flavor producing bacteria, and the other section of the country is not infected with that kind. They all have bacteria enough, but they are not the same species.

One of the greatest reasons, in my opinion the chief reason, why butter made in June is better than butter made in December is that the species of bacteria that get into the cream in June are different from those that get into it in the winter. The June species produces a good flavor, and the winter species not so good. That is not a matter of guess, it is a matter of experiment to a certain extent. In my own experiments I have studied the species of bacteria present in winter cream, and the species present in June cream, and they are entirely different. You will find hardly one of the same species in the winter that you do in the summer. Grass does not grow in the winter, neither do certain species of bacteria. I have found, too, that as a rule the species of bacteria that you find in June cream produces a better flavor than the ordinary ones found in the winter. In my opinion the chief reason why June butter has a better flavor than winter butter is that June butter has a better species of bacteria present, and there is no question that one of the great reasons why certain localities can produce a better flavored product than others is that some localities will be infested with one kind of bacteria and others with another kind, and some species produce better results than others. If you happen to live in one of those localities where there are only indifferent kinds present you cannot get a good flavor in your butter; cleanliness will not do it, and no method of feeding will do it. Do not understand me to say that feeding has no effect on butter flavor. But I do say that if you chance to live in places that are infected with bacteria which are not good flavor producers you cannot get good flavor by any method of feeding; while on the other hand, if you live in a locality where there are good species it is a comparatively easy matter for you, if you will simply be cleanly, to get good flavored butter.

So then, I say, at the present time the question of getting the right species of bacteria is very largely a matter of luck. The butter maker does not know there is any luck; as a rule he does not know he has to deal with bacteria. He does not know what he is doing when he is ripening his cream. He simply knows that he is heating it to a certain temperature and letting it stand for a certain length of time. But it is a pure matter of luck. Already in the great brewing industry our brewers have learned that they cannot depend on luck. The time was when brewing was carried on in the same blind way; when the material to be fermented was allowed to ferment spontaneously. But our brewers have long since learned that that would never do. They must have a better control over the process of fermentation. So the brewer plants in his malt the kind of yeast he wants there. He raises it, lets it grow, and then puts it in his malt and lets it ferment. This method has been adopted for years. Of course every one is familiar enough with the process of fermenting with yeast, and you know that in the compressed yeast cake we have a plant which has been cultivated and grown in a certain laboratory and then has been condensed and given to you, for use. You put it into your bread, or beer, or whatever you want to ferment, and that little plant grows. So this plant is distributed over this country. Let me give you a little bit of history, the application of which you will see presently. After the Franco-Prussian war, the Frenchmen drove the German beer-makers out of Paris. Of course they did not do it with the bayonet, for they could not, but they succeeded in making it uncomfortable for the beer-makers and they left Paris. That left the Frenchmen without beer-makers, because up to that time practically all of the beer had been made by Germans. Therefore, the Frenchmen had to make their own beer and they soon found themselves in great difficulty. They could not make good beer. Sometimes the beer would be good and sometimes it would be bad. Tastes would arise in it that they did not like, they could not control it. After trying a while and becoming somewhat discouraged they thought they would ask their great microscopist, Pasteur, to look into the matter. Pasteur agreed and came to the brewery with his microscope and began to study the process of beer making. He soon found why it was that they could not make good beer uniformly. They did not use a pure kind of yeast. They would plant yeast in the malt, but it was likely to contain besides the yeast four or five kinds of bacteria. If one kind happened to be in the yeast the beer would become slimy; another kind would cause the beer to have a sour taste, and another a bitter taste. In other words he found that the irregularities were due to the fact that they did not have good, pure yeast. He said, "The remedy is simple. You must get good yeast and use it, and you must not use it unless it is pure." And to-day there is not a brewery in the civilized world that does not have its microscopist and its microscope. The brewing industry is an enormous one at the present time, and that immense industry would be absolutely impossible to-day without the microscope. When our fathers fifty years ago tried to make beer it did not make much difference if occasionally eight or ten gallons were bad; they would throw it away and start again. But take one of these big breweries making fifteen or twenty thousand dollars worth of beer a day, and let their beer become bad for two days and it wrecks the whole business. A big brewing industry is impossible until it is possible to control the process of fermentation.

Now you will see that the process of beer-making is in a measure parallel to this process of cream ripening. The trouble with the beer was that they could not control it, and the trouble with the cream ripening is that you cannot control it. Sometimes your butter is good, you do not know why; sometimes it is bad, you do not know why. You cannot control it. You say, "The trouble is that the farmers have been sending me bad cream." The farmers say that they have been doing just the same as they have always done. They cannot find the trouble and you cannot. You have simply to make up your mind that something is wrong and go on making bad butter until the butter becomes better. This is a serious matter for our creameries, and for you Maine farmers that want to make butter that will command the top price in the market.

Is there any way in which we can control this matter so that our butter will have a uniformly good flavor? Theoretically, yes. If the proper flavor is produced by a certain kind of bacteria why not get that kind and plant it in your cream? Simple enough in theory. Just the same thing is being done in brewing. The proper fermentation is due to the growth of the right kind of yeast, and in order to produce the right kind you have to get your yeast and plant it, the result is then uniform and constant. Why cannot we do the same thing in cream ripening? Theoretically it is possible. Some six or eight years ago I began to talk about this to the dairymen down in my part of the country, and of course they laughed at me. They are laughing, some of them, still, and will continue to laugh, perhaps, for a short time longer. But they do not laugh as much as they did. I tell you there is no question but that the future of dairying is going to see the application of just that same principal to cream ripening that Pasteur applied to beer fermentation. It is coming, how soon we cannot say. It was some six years ago that it was first thought of by a Danish bacteriologist named Storch. It occurred to him that it might be possible that he could get the right kind of bacteria, could cultivate it and give it to the butter-makers and they could put it in their cream. He tried it and had some success. He was followed in Germany, and in the last five or six years the process of using what are called pure cultures has become somewhat common in certain regions in Germany and Denmark. A pure culture, let me explain, is nothing more than a large quantity of one particular species of yeast. It is like a bushel of one seed corn. A pure culture of bacteria is a great quantity of one kind of bacteria. Now in Germany and in Denmark for four or five years there has been a growing use of pure cultures for cream ripening in exactly this line that I have been describing. The bacteriologist has developed the bacteria, has first found the right kind and then caused it to grow in his laboratory. Then he gives it to the butter maker, the butter maker puts it into his cream, and has a greater uniformity in the ripening process. In this country, the process has never been introduced to any extent until within the last nine months. One of these pure cultures was introduced two or three years ago, but it was never used except in a very few experimental instances. Within the last year the matter has become very common, and at the present time in our Western states particularly, pure cultures are being used quite a little.

Now I did not come down here to-day to say anything in regard to any particular culture of bacteria. I suppose some of you know that I have been fortunate enough to have obtained one kind of bacteria which has been producing some exceptionally good results in butter-making. I did not come down here to tell you about that, but to suggest the general principles of cream ripening. I do want to point out one fact in connection with this use of pure cultures in cream ripening. There have been, six or eight different kinds of pure cultures put upon the market for the use of butter maakers. By six different kinds I mean six different species of bacteria have been used, one man using one kind and finding it good and introducing it to his friends, and another man another kind. There are thus perhaps eight pure cultures in use in Europe. We find in the use of these cultures two different principles, and the two different principles have depended on rather peculiar facts. I have been speaking this afternoon of what I have called cream ripening. That term is probably familiar to you all. It is a term that is common in this part of the country and quite common in many other parts of the country; but in still other parts of the country and uniformly in Europe you never hear of cream ripening. They always speak of cream "souring." Of course you know that the ripening of cream sours it. That is its most noticeable characteristic, the cream always becomes sour when it is ripened. Now as a result of that, all of the European bacteriologists who have been trying to get hold of the right kind of bacteria to use for the purpose of ripening cream have been hunting after bacteria that will sour the cream. Those pure cultures that I have been speaking of, are almost entirely souring organisms. If you add them to the cream, it will sour, and if you add them in large quantities, the cream will sour very rapidly. As a result, those cultures cannot be used in ordinary cream without first destroying the germs already present. If you take cream such as is brought to your creamery, that is already beginning to sour, and add to it a large quantity of one of these pure cultures, it will sour so fast that you will not get the proper results. And so it is necessary to have the cream pasteurized before the pure culture is added.

The other principle, upon which one of these species used, has been devised, is based upon the idea that the flavor, which is what we are after in the ripening, is produced not by an acid germ necessarily, but it may be produced by germs that are not acid producing. One of these pure cultures that I have referred to is a species that does not sour the cream, at least it sours it scarcely at all. This organism can be added to the cream without pasteurization, and it does not hasten the souring.

All this perhaps seems to you fanatical, or fanciful or absurd. There are, however, at the present time, at least 300 creameries in this country, making butter varying all the way from 200 to 1,000 pounds a day, that are making all their butter by the process that I have just been speaking of, namely, they put into their cream one of those pure cultures of bacteria. This has all been developed within the last nine months, the most of it within the last four months. The number of creameries that are using these pure cultures for this purpose is increasing very rapidly at the present time, and they claim to be perfectly satisfied with the results. I do not care to go into the results here, I am simply after the principle. As I have said, at least 300 creameries at the present time are using this method that I am attempting to describe to you. The method consists simply in taking a certain species of bacteria and cultivating it until they are very numerous, then putting them right into the cream. Being added in superabundance they grow there and produce a flavor. Then when the cream is churned the flavor that was lacking before has been obtained. This method has been introduced into many a creamery that was unable to get the proper flavor, and the flavor has come. It has been introduced into creameries where the flavor was bad and the bad flavor has been replaced by a good one.

I think you will agree with me that the theory of ripening cream with these pure cultures is a correct one. I think you will see that it is the identical thing that is done in brewing, in the manufacture of beer; that the use of these pure cultures is just the same as the use of compressed yeast in your household affairs; and that the proper flavor is obtained by the proper use of the proper kind of bacteria.

Now I may, perhaps, be permitted a little prediction. You want to know what the future of dairying is to be. The future of dairying, in my opinion, is to be this; in the first place the use of the process of cream pasteurization will increase. In the future all of the creameries that want to make A No. 1 butter, and get the highest prices, will pasteurize their cream and then add to it a pure culture of bacteria, for the purpose of ripening it in the proper way and giving the proper flavor thereto.

I think that I have taken now all the time I should unless a discussion of the subject is wanted, which could be brought out better by questions.

Let me, in a word, summarize both the practical and the theoretical results, as given in my talk this afternoon.

First, the ripening of the cream gives you your flavor, say what you like as to foods. Foods have an effect upon the flavor undoubtedly, nobody denies it. But say what you will, the chief factor in giving you your flavor is the ripening of your cream.

Second, that ripening of the cream is a fermentation, produced not by yeast but by bacteria.

Third, the proper flavor, the gilt-edged quick grass flavor, call it what you please, the high priced flavor is produced by some kinds of bacteria and not by others. Bad flavors are produced by some kinds of bacteria and not by others.

Fourth, there is no absolute rule that I, or any one else, can give you, by means of which you can rigidly avoid getting the improper species of bacteria in your cream. You can very greatly remedy matters by strict cleanliness, remembering that the source of most of the mischievous organisms is filth, filth on your cow, on her udder, in the milk ducts, clinging to her hairs, in the milk vessels, on your hands, on your clothes and in the dust from the food that you have stirred up before milking. Cleanliness will enable you to avoid many of them.

Fifth, cleanliness will not enable you to get the proper flavor producing species. Whether you have them or not is largely a matter of accident. Most localities in the country have some of them. Some localities have better ones than others.

Lastly, it is a perfectly possible thing, and in my opinion a perfectly practical thing to furnish a creamery with the right kind of flavor producing organisms, that the creamery operator may introduce it into the cream and thus be sure of getting the right flavor. The result of this will be, above all things, in the greater uniformity in the cream ripening; and in a greater uniformity in the butter that is produced. When our butter-makers learn to introduce into their cream for ripening, the kind of organism that they want, then they will not be afraid of the season when the cows go to grass in the spring, nor when they come from the pastures to the barn in the winter. Then they will not be troubled by occasional instances of bad butter. Then, and not till then, will the same uniformity in cream ripening be introduced in our butter-making as has been introduced in the process of fermentation in beer.

Ques. Can these men and women, situated as they are to-day, do anything to get into their cream the good kind of bacteria, and if so, what?

Ans. There is absolutely nothing that they can do so far as I know, beyond the matter of getting these organisms through dairying concerns. There are several cultures that are being slowly put upon the market and being introduced. They have been introduced not only in creameries but in private dairies. Apart from that I know of absolutely nothing that will ensure the presence of the right kinds of bacteria in your cream; but I think I have stated, and I repeat it, most of the organisms are harmless and most localities have some good organisms. Consequently strict attention to cleanliness is the best panacea for the evils in cream ripening that we have at the present time, until there is a wide introduction of pure cultures.

Ques. Would it be of any use, or feasible, to use a pure culture in cream that has come in with the cream gathering system in all stages of fermentation?

Ans. In connection with that there are two matters which I might speak of. Before answering Prof. Jordan's question, let me mention, first, another method of obtaining cultures which perhaps gives a little better answer to the question of our chairman; and that is in the use of what are called natural starters. You can all of you, perhaps, help matters a little in this way, perhaps decidedly so. Suppose, for instance, a creamery should have 100 patrons, and suppose the butter maker should, by a little experimenting, find one patron that always had good cream. Then let that butter-maker take two or three gallons of cream from that patron and allow it stand in his creamery for twenty-four or forty-eight hours and get decidedly sour. Let him then pour that into his vat, and he will have what is called a natural starter. He will have then the best chance of getting the proper flavor that he can have with the common methods. He takes the best cream he can get and lets the bacteria grow until they are very numerous, and then adds that cream to the vat, and the bacteria in that cream will help to produce the proper results.

Now, to answer Prof. Jordan's question, Is it possible or advantageous to use these pure cultures in mixed cream that has been brought to a creamery and is already inoculated with this host of organisms, yes, it is; and up to the present time in these 300 creameries that I have been speaking of, more striking results have been obtained under those conditions than have been obtained in using separator cream. The explanataion is simply this; the cream is brought to a creamery from a hundred different farms, perhaps, and contains mixed bacteria, no single species of which will be in very great preponderance. Each farmer will contribute perhaps half a dozen kinds, some of which may be the same kind that another farmer contributes, but there will be no great preponderance of any one of them, a host of species but none of them particularly abundant. Now if you take a pure culture that is known to produce flavor, and let it grow in your laboratory or in your creamery until you get a large culture (by a large culture of course I mean a culture containing a vast number of organisms) and pour that into that mixed lot of cream, you have added to that mixed cream perhaps 1,000,000 of the kind of bacteria you want to every one of any other kind that may be there. That 1,000,000 will grow so much faster than the others that they will actually produce their own flavors and conceal the effects of the injurious ones. Among the creameries in this country, this use of pure cultures has been tried in cream that has been gathered in this way once a day, cream gathered every two days, cream gathered twice a week and in separator cream which is absolutely fresh. The butter produced from the separator cream is always much the best, but the improvement that has been made in the butter manufactured from gathered cream has been very striking, so much so that in a letter which I received from an efficient inspector of butter in New York, he stated that he had had some butter from the separator system and some butter from this system and could not distinguish between them. These pure cultures have been used in making butter according to the gravity system, where the cream is brought in from a host of different sources, and the butter has been lifted nearer to the level of that made from separator cream. It has not quite reached that, in any experiments that I know of, but it is decidedly nearer to it than it was before. This is simply due to the fact that the using of a pure culture inoculates the cream with thousands of the kind of bacteria you want to every one of the kind that you do not want, and those thousands grow so fast as to obliterate more or less the effect of the others.

Prof. JORDAN—Will the organism reproduce itself in kind as surely as a pig will produce a pig, and a cow, a cow?

Ans. I wish it were absolutely possible to answer that question. It is a question that our bacteriologists have been puzzling over for thirty years and have not quite settled yet. Nevertheless, I can say this, in regard to some of the pathogenic germs, it is certain that they do not continue indefinitely to have the same characters that they have at first. The organism that is known to produce pneumonia, if it is kept growing in a laboratory for three weeks, ceases to have the power of producing pneumonia. On the other hand there are species that are positively known to retain their characters, I may say indefinitely. In 1882 Prof. Koch discovered the organism that produces tuberculosis. That organism has been growing from that day to this, and has now exactly the same characteristics that it had at first. Sometimes they change, but at other times they certainly remain constant.

In regard to these organisms that have been used for ripening cream, practically nothing is known; at all events, I have no knowledge of any except the one that I have personally found. That one, which has been named by the butter-makers of the country B 41, was found two and a half years ago in Chicago, in milk that was sent from Uraguay. I have kept it for two and a half years under constant observation. I have put it under every condition I could think of, changing conditions of temperature, heat, moisture and food, and I cannot see that it has changed its characteristics in any respect. But to make any absolute, sweeping answer to this question is impossible.

Question by Prof. Jordan. Is it a fact that several families or species can grow in the same liquid, or will they quarrel, and one must have the house to itself?

Ans. The probability is that a royal battle goes on in the cream. The mixed cream that is brought to the butter-maker's vat contains, we will say, forty different species of bacteria, and they will undoubtedly have a royal battle with each other during that twenty-four hours in which the cream is ripening. Some of them are driven out of existence, or at all events do not get a chance to grow; others get the mastery. Now it is not proper to say that in any case any one obtains absolute control of the cream. At the end of twenty-four hours you will find a great many kinds that are numerous, and more numerous than they originally were, while others that were there at first will be crowded out of existence. Some will have grown slightly, others prodigiously. But as a rule the ones that grow the most rapidly and produce the most permanent results, are those that are present in the greatest abundance at first. That is a principle of bacteriologists, called "mass culture." By inoculating the cream with a host of one kind, those present in small quantities can be almost exterminated. That, of course, is a partial reason why the use of pure cultures may be feasible in unpasteurized cream. By adding to such cream a large quantity of the right kind of organisms, the others will not get a chance to multiply very much.

Question by Prof. Gowell. When our butter-makers have a lot of cream from which they are sure they are going to get bad butter, they seek to mask the flavors of that butter by salting it heavily. Does the introduction of these bacteria simply mask the bad flavor or does it impart the fine flavors we are looking for?

Ans. I do not believe it is possible to answer that question positively at the present time. You must bear in mind that this particular organism that I am familiar with, has only been used in creameries about nine months, and that is rather too short a time to get all the data necessary. I can simply tell you some experiences in this line. For instance, two months ago, I had a letter from a creamery near my own home. The man wrote that his butter had had a bad taste all summer, and he went on and described his methods and wanted to know if I could suggest any way in which he could improve them, and get rid of this bad taste. I sent him some of this organism to see what he could do with it, and had a letter from him a short time afterwards in which he said that a week after he received the culture, the bad flavor had disappeared entirely, and there had appeared in its place a flavor that he had never been able to get in his cream before.

Another illustration comes from Iowa. The expert butter-maker of a very large firm, a firm that handles 3,000,000 pounds of butter a year, had been accustomed to ripen his cream having the vat covered with some tight covering. It was cream from the gathered cream system. He said he had found that after the cream had been ripening for twenty-four hours it would have a very unpleasant odor, and when he took the cover off he would always turn his head away so as to let the first odors go off in the air. But after having inoculated the cream with this organism he never had that difficulty. The odors obtained were sweet from the first. So far as those facts go I think you will see that they rather indicate that the presence of the pure cultures does not simply mask bad flavors but produces good flavors. It prevents to a certain extent the development of bad flavors. and stimulates the development of good ones. That seems to be the fair inference from what data we have at the present time.

Ques. Is it practicable to have a natural starter in private dairying, as you have spoken of in associate dairying?

Ans. I should say not as I described it. If a private dairyman wants to use a natural starter I should say his only way of doing it would be to find a friend somewhere near who made better butter than he did, and get some of this man's cream as a starter. You could not well take a part of your own cream and get a natural starter. Perhaps if you had a dozen cows you could get a starter from each cow and see which worked the best, but it would be rather a long and unsatisfactory process. The use of natural starters is becoming somewhat common, and the use of starters in creameries is spreading with immense rapidity all over the world. There is no question but that in the course of a short time, no creamery will attempt to make butter without using some kind of a starter.

Ques. In the illustration used this forenoon in regard to the turnips, do you consider that that butter would have had the turnip flavor had the cows not eaten the turnips, but merely been shut up in the barn with them?

Ans. I do not think the fact that the cows ate the turnips had anything whatever to do with it. The fact that the man could produce good butter and still feed turnips would indicate this. I do not mean to say that nothing that the cow can eat can flavor the milk, nor do I mean to say that it is impossible that the turnips that the cow eats may sometimes flavor the milk. But in this particular instance where the barn was shut up, containing the decaying turnips, I think the flavor was due to absorption. There are various kinds of food that affect the milk and the butter, but in that immediate instance the bad flavor was plainly due to the absorption of putrefying gases.

Question by Prof. Bartlett. Have not the foreign investigators obtained better results from using two or three kinds of bacteria than from using any single one?

Ans. Practically nobody knows anything about it. The cultures that are on the market in Europe are practically secrets. The probability is that the answer to your question is yes. I think there is very little doubt that the best results are to be obtained from the use of more than one species, but nobody knows what these commercial products are.

It should be stated, perhaps, that in the most recent foreign tests that I have seen, the lactic ferments that have been used have not produced results any better than those of the best kind of natural starter, made from the nicest cream.

Ques. Is cream invariably the medium of these pure cultures for commercial purposes?

Ans. Oh! no. The pure cultures for commercial purposes are distributed in various ways, some of them in the form of milk, others in the form of a powder. One that I have a knowledge of is distributed in a form that is practically like a yeast cake. It is simply a little glass tube with something like dough inside. These forms are more convenient for distribution than milk or cream.

Adjourned to Thursday evening.

REMARKS BY MR. E. A. HARRIS OF BOSTON.

Mr. Chairman, Ladies and Gentlemen: I have noted with a great deal of pleasure a decided improvement in the quality of the butter exhibited here to-day, in comparison with the exhibit at Farmington last year. The distinctively Maine flavor, as we have called it in Boston, seems to be vanishing, much to my joy; and the decidedly objectionable flavors are not nearly as numerous to-day as a year ago. There has been a wonderful improvement in the packages of butter, especially from the creameries. I never saw, anywhere at any time, butter more attractively placed in tubs than I have seen here to-day. Great care has also been exhibited in nearly all of the printed butter; great pains evidently has been taken. Although the highest score to-day is a little below the highest at Farmington, I think that the average will be considerably above the average of last year. The highest score to-day is ninety-four and three-fourths, but there have been several very fine samples of butter, quite a number that have ranged above ninety which I think is very creditable indeed at this season of the year; and I congratulate the dairymen of Maine upon the progress that has been made during the last twelve months. Last year I remarked that Maine had not kept up with the procession, but this year I think she is gaining upon it.

A BREAD AND BUTTER LECTURE.

By Miss Anna Barrows.

Ladies and Gentlemen: The subject of the lesson to-night is a large one; and while at first bread seems to have no direct connection with a dairy meeting, still the most of the butter that we consume is used in conjunction with bread, so it seems appropriate that bread should have a place in the work of this association. As I am to-night to use a slightly different form of oven from that which is commonly used I shall give a few words of explanation in regard to that, especially as I already have some dishes cooking in it.

The principle is the same that is carried out in refrigerators, only in this case instead of keeping the heat out we are trying to keep the heat in. There is a non-conducting substance all around the oven, a sort of jacket, as you will see by the thickness of the walls, and that retains the heat so that there is little or no fuel wasted. In our ordinary cooking stoves, there is a great waste of fuel, but here about ninety per cent, it is estimated, is used. This oven is heated by an ordinary lamp, which has a black chimney because less heat is radiated from it in that way. Lamps of different sizes may be used. The lamp was lighted at about four o'clock, and between that time and five o'clock, an Indian pudding, some small loaves of brown bread and a piece of tough meat were put into the oven, and those have remained there until the present time with little or no care. During the evening I shall bake, or partially bake, a few more articles, but the principle of this oven is such that it requires a rather longer time for cooking than the ordinary stove oven. It is estimated that it usually requires once and a half or twice as much time for the cooking. The heat is more gentle and it takes longer to do the work, but the result is better than in our ordinary stoves, where too often the outside of the roast or the loaf of bread or cake is scorched before the inside is properly cooked. In baking bread, or anything that is made with yeast, it is best to put it into the oven before it has risen quite as much as it would have to rise before baking it in an ordinary stove oven, because the rising process continues in the oven for a little time longer, on account of the more moderate heat. That is all I have to say in regard to the oven unless some one here has some questions to ask during or at the close of the evening's work.

I have here a pan of buns which were made up about three o'clock this afternoon, and were put into the pan about an hour ago. They are now nearly doubled in bulk, and that is the test that we generally apply to all raised dough. When it is double in bulk it is ready to bake. I shall put these into the oven now, as they are in a good condition to bake, and allow them to bake for about an hour. A little later if we have time I may prepare another dish showing the use of the oven further, but at the present time the pan of bread which I have here evidently requires our attention, and while I am putting that into the pans I will explain the general process of bread making.

It would be quite impossible in the short period which can be devoted to this topic to-night, to cover the subject of bread making fully. It is far too large a topic for a single evening. In giving a bread lesson, whether in a practice class or a demonstration lecture of this sort, it is my custom to have some of the bread already raised to shape and put into the pans, and then while that is rising the second time, mix more bread. To-night I shall not mix more bread but will tell exactly what has been done with this, and while explaining that, explain the general process of mixing bread.

I trust that every one who is here to-night was here this afternoon and heard the explanation which Dr. Conn gave of the brewing business, and the progress made in that direction. It is rather a shame to us, but I suppose it is strictly true, that the most that we know about yeast has been learned not for bread making but for beer making. A few years ago I had an opportunity to go through a large brewery near the city of Boston, and when I saw the care which was given to every detail of the process and the absolute cleanliness of every part of the work, I thought if we had only put bread-making on such a plane as that the breweries would have less work to do. The process of bread-making as carried on in our houses is not always up to the standard. There is much for all of us to learn, but I think that it is wonderful that we succeed as well as we do in our houses when there are so many other things to be done at the same time, because bread is something that really should have closer attention than it often gets. That is one difficulty in making bread and leaving it to rise in a hall like this where the temperature is variable and where there are drafts, it is impossible to give it quite the care and attention that it needs. As I was coming here this forenoon I heard one gentleman on the train say to another, "At what temperature do you churn?" I wondered how many housekeepers had reached the point of watching the temperature at which the bread is left to rise. When we study all these things as carefully as it is necessary to study them when our food has a commercial value, then we shall have better standards and better results.

This bread was made from a pint of liquid and three pints of flour. This afternoon I used milk as the liquid because milk was very abundant here, but we may use milk or water, or half milk and half water. I suppose every housekeeper has her preference and will vary her mixing according to the material that is most convenient. The milk was scalded, and I then put into the pan a tablespoonful of butter, a tablespoonful of sugar and half a teaspoonful of salt; then, after the milk had cooled a little, a half yeast cake. After these things were all dissolved and well mixed with the milk, I stirred in three pints of flour, or enough to make a dough that can be easily handled. I kneaded it a few moments in order to get it into shape and then left it to rise. Half an hour ago I cut this down slightly, because it had already risen to fully double the original bulk. Now I want to get this into shape to put into the pans, and I wish to do it without the addition of any more flour. The addition of flour now would retard the process of rising considerably, and we do not wish to do that. This quantity of bread is sufficient to make a small loaf and a panful of rolls, or it would make two small loaves. One of our greatest mistakes in bread-making is that we make too large loaves, rolls or biscuit, placing them too close together in the pan, so that the bread does not get sufficiently baked. And that is where the people who advocate the use of baking powders instead of yeast can make a point against us, because these large loaves and biscuit placed together in the pans do not always get thoroughly cooked, and there may be some traces of the yeast fermentation that are not destroyed.

In regard to kneading bread, it seems to me that a great deal of time is wasted. I think that when the bread is first mixed it is not a bad plan to knead it long enough to be sure that there are no lumps of flour. The old fashioned way of making bread was to put the flour in the pan, rub the shortening into that, and then make a hole in the middle and put in the yeast, sugar, salt and everything else that might be used, and proceed to mix the dough in that way. Very few cooking schools follow that plan to-day. There are several reasons. In the first place, it is easier to determine the quantity of bread by a given amount of liquid than by a given amount of flour, because flour varies so in absorption of liquid. The liquid will be a more correct measure of a given quantity of bread.

Another thing, it is a waste of time and strength to rub shortening into the flour for such a purpose as this. A little later I shall speak of other cases where we may wish to rub the shortening into the flour, but not for bread, because the bread is better made with a warm liquid; and if we make the bread with a warm liquid why not use that to soften the shortening that we may use, and thus carry it smoothly and evenly through the dough.

Again, if we use sugar and salt in the bread, these are more perfectly mixed with the dough by dissolving them in the liquid; and the yeast also is more perfectly mixed with the liquid. Thus we can mix the shortening, sugar, salt, yeast and liquid perfectly, and then mix in the flour. When we get in flour enough so that the dough separates easily from the edges of the pan, we know that we have sufficient flour to make it possible to handle the bread. If we are using pastry flour, or winter wheat flour, we shall find that it usually requires more than when we use the spring wheat, or ordinary bread flour. I do not know the brand of the flour which I am using, but it is one of the spring wheat flours.

In shaping the dough the first time, I take it out on the board and knead it for a few moments, and then I have no objection to working in a little more flour, because the flour in the dough has not undergone any chemical change such as takes place in it while rising. But now I do not want to work in any more flour, as the dough is stiff enough to handle easily, and I can handle it without the addition of any flour. My idea is that many people knead bread at this stage a long time because they add more flour and it is necessary to knead it to work that flour in. I have seen a loaf of bread the outer crust of which was hard, dry and crackly, almost pebbly. This sort of roughness showed that the flour had not been perfectly worked in at this time. But if we add no flour, all we have to do is to work the dough until it is smooth and there are no air bubbles in it, and then put it into the pans. I have the pans about half full, because I must give space for the bread to double in bulk in the pans before it is ready to bake.

To go back to the ingredients, some persons may prefer to use sugar, salt and shortening ,and others do not use any of these substances. It is sometimes said that salt is the bridle which holds back the yeast from working too actively, while sugar in moderate quantities is the spur which hurries it on. A little sugar undoubtedly helps in the fermentation. Some people prefer not to put shortening into the dough, but to rub a little over the outside of the dough when they put it to rise. In that way the fat prevents evaporation from the surface of the dough and there is no danger of a dry crust forming on the outside while it is rising. The fat tends to retard the rising, when it is put into the dough, so that many persons prefer to rub a small quantity of butter or lard over the bread rather than to mix it with the dough.

In regard to the quantity of yeast, I made this bread up about four o'clock and used a generous half yeast cake. If I were making bread up now to rise over night, I should use less than a quarter of a yeast cake. I might have made the bread up at six o'clock and had it ready to handle now by using a whole yeast cake. We then may vary the proportion of yeast according to the time that we have at our command for this purpose. The compresed yeast, such as so many of us use now, does the work rather faster than the old fashioned home made yeast. And by the way, I wonder if many of the ladies this afternoon, in hearing Dr. Conn speak of borrowing some cream with the proper flavor in it from the neighbors, were not reminded of the old fashion which some of us still follow, of getting some yeast from our neighbors when our yeast jar is empty, with which to start some new yeast. That shows that there is a similarity between the action of the ferments of which Prof. Conn was speaking this afternoon and the action of the yeast. Therefore, because the subject has been so fully covered this afternoon I shall say very little about it to-night; but simply state that yeast belongs to a low order of plants, it is one of those ferments. There is a great variety of yeasts, and by careful selection for a great many generations the human race has finally found that there are certain species that do the work better than many others.

The story is an old one, and yet a good one for us to think of, that the probable origin of yeast was that in some warm climate, where in the early days of civilization dough was simply flour mixed with water and baked, some of that dough was left over from one day to another and the ferments which are always present in the air settled upon this dough and began to work in it and thus it became light and full of air, and that lot of bread was rather preferable to some of the previous ones; and by some such accident as that, the experiments gradually developed into our yeast. As there are so many varieties of these ferments, and we learned from the talk this afternoon what constant trouble they are causing the dairymen, it is not to be wondered at at all that occasionally some bad ferments should get in with our yeast and the work should not proceed as satisfactorily as before. That is a sufficient explanation of many of the difficulties which people have in making bread of yeast. These little compressed yeast cakes have accomplished a great deal in that they give us a fairly uniform standard. Of course many housekeepers prefer to make their own yeast, or are so far from the centres where these yeast cakes can be obtained fresh that they cannot well use them. Still I suppose the bread is very much better as a whole throughout our land, than it was before the centennial celebration at Philadelphia in 1876, which introduced these compressed yeast cakes to us.

I have been shaping the remainder of the dough into little biscuit. Often with a class, after every pupil has shaped the bread into a little round ball, we go on to the next stage, which is to roll it out a little further until we get what is known as the finger roll, and then carrying this still further we get the long stick which may be coiled or twisted to make any of the fancy shapes we are all familiar with. These little rolls, with crusty surfaces, are much more wholesome than rolls put closely together in the pan and allowed to rise until they are soft and high in the middle, with very little crust.

While there has been a great deal of progress in bread-making, still I think that, as a whole, our cooking has staid behind, except in cases where the cooking has a direct commercial value. We find more progress, so far as improved appliances and methods of work are concerned, in hotels, restaurants and places of that description than we do in our houses where there is no direct commercial value placed on the food, or on the time of those who prepare the food.

It is a large question, but I am coming more and more to the conclusion that one reason why so many young women are ready to leave their homes and go out to work elsewhere is that there is no direct money compensation for the work that they do at home, and because the kitchens are not kept up to the times. Utensils of all sorts will be bought for the farm, where there is to be any direct money returns, but the kitchens are not well provided with all sorts of appliances, and it is really a making of bricks without straw. And so one reason why our housekeeping has staid behind in the progress of civilization is that there is no direct recognition of the value of woman's work.

Sometimes we are not ready to believe that much progress is being made, and are quite ready to be contented with the way in which we have always done different things, and I think it is a good thing for us to look back occasionally and see how people did things one hundred or two years ago. In reading for the talk which I wanted to give to-night I came across one or two little things which I would like to read here simply as an illustration of the progress that has been made in butter making.

Butter making charm. A writer in 1685, mentions "That an old woman in Essex came into the house when, as the maid was churning the butter, and having labored long and could not make her butter come, the old woman told the maid what was wont to be done when she was a maid, and also in her mother's time, that if it happened their butter would not come readily they used a charm to be said over it; whilst yet it was in beating and it would come straightways, and that was this:

" 'Come, butter, come! Come, butter, come! Peter stands at the gate, waiting for a buttered cake, come, butter, come!'

" 'This,' said the old woman, 'being said three times, will make your butter come, for it was taught my mother by a learned churchman in Queen Mary's days, when churchmen had more cunning and could teach people many a trick that our ministers nowadays know not.' "

Another story is told of the household of Sir Thomas Moore by his daughter Margery.

"Grievous work over nighte with ye churning. Nought would persuade Gillian but that ye cream was bewitched by Gamme Gurney who was visiting last Friday with her dole, and hobbled away, mumping and cursing. At all events ye butter would not come; but mother was resolved not to have so much good cream wasted, soe sent for Bess and me, Daisy and Mercy Griggs, and insisted on our churning in turn until ye butter came, if we sat up all nighte for it. 'Twas a hard saying, and might have hampered, like as Jeptha his rash vow. Howbeit, so soon as she had left us we turned it into a frolic and sang Chevy Chase from end to end to beguile time, ne'ertheless ye butter would not come. So then we grew sober and at ye instance of sweet Mercy chanted ye 119 psalm; and by the time we had attayned to Lucerna pedibus I heard ye buttermilk separating and splashing in right earnest. 'Twas near midnight, however, and Daisy had fallen asleep on ye dresser. Gillian will ne'er be convinced but that our Latin broke the spell."

There are a great many cases in our housekeeping when we have thought there was some spell or some luck about it; and yet if we could once get down to the centre of things we should find that there is a reason for every part of our success or failure. Many a time in bread making we shall find that our success, or lack of success, comes from attention or inattention to the proper temperature of the bread. Yeast, as has been said, is a little plant; a very low order of plant to be sure, but nevertheless governed by the laws that govern other forms of plant life. The soil that it likes to grow in, is the dough made from wheaten flour. The flour alone is not sufficient, it must be moistened, just as the soil must be moistened for any plant to grow. Then the dough must be kept at a suitable temperature. The yeast does not like to be kept in a very warm place for half an hour, and then put in a very cold place for a time and then back again in a warm place; nor to have one side of the pan hot and the other ice cold. Occasionally we find that, when we have put our pans of bread against the stove so that they may rise as fast as possible, and have neglected to turn them, the dough on one side is baked and on the other side has hardly risen at all. The better way is to put the pan of bread into a pan of warm water, and change the water occasionally so that it can be kept at a nearly uniform temperature. It is not easy to keep the temperature uniform without a thermometer, but the days are coming when a thermometer will be quite as essential in the kitchen as it is in the dairy. The moisture all around the bread is an advantage in the bread raising. It is not enough, always, to have the moisture just under it, but it is a good thing to have it over it as well. Often if we set the pan of bread in a pan of warm water, the upper part may be cold, but there are various bread raisers that are made something on the principle of this oven, only instead of the powerful lamp a very tiny lamp is used so that it cannot possibly cook the bread, for we do not want the bread to cook until the yeast has done its work. A pan of water is placed over the lamp and the heat from the lamp is sufficient to turn some of the water into steam so that the moisture works all around the pans of bread, and the heat is kept uniform. The door is made of glass so that we can see what is going on inside. It is possible in that way to calculate exactly the time required for the raising, as is not possible in a room where there are drafts and where the temperature is variable. I suppose every one of the housekeepers here has at some time, in making up bread on a cold night to be left in a kitchen where the temperature may be variable, mixed her bread in a thick earthen bowl because that would part with the heat less readily, and then wrapped it in a blanket or something of that sort, so that the heat would be kept in. Or perhaps put it on a soapstone, in order to keep it at the proper temperature during the night. A great many such devices have been handed down to us from the preceding generations, and we go on using them without ever stopping to think just why we are doing these things. The cooking schools are trying to take the experience of the past and join it to the knowledge of the present, and put it in shape to make house-work easier and so that we may know the reasons for whatever we are doing. The cooking schools are trying to do for the housekeepers something the same thing that the experiment station and agricultural colleges are doing for the farmers.

We must consider not only the question of yeast, but of the flour. The winter wheat flour is not as "strong" a flour and does not absorb as much water as the spring wheat flour. Then there are the brown flours, the graham, the whole wheat, the entire wheat, and many brands, manufactured in slightly different ways. We know that in those flours we get a great deal more of the bone making material than we do in our ordinary white flour; and it is strange to see how anxious we are for white bread, when white bread is really the least nutritious. The whole wheat flour is really much more nourishing and more satisfactory. It is not usually best to make the doughs from those flours stiff enough to knead.

There is a point which again connects the bread making with the question of butter making. I have noticed several allusions to the kind of air which is present in the dairy and gets mixed with the cream and with the butter. It is equally important in our cooking that good, pure air should penetrate our food rather than air that is heavy with all sorts of odors. I have often thought in passing by some of the bakeries and hotel kitchens in the cities, where the kitchens come out almost under the sidewalks, that the air that is put into the food there cannot be as sweet and pure as it should be. In many of the newer hotels and club houses the kitchens are at the top of the house, so that, as smells go up rather than down, the rest of the house is free from the odor of the kitchens; and surely the air that is incorporated in the food is much purer than it would be under other conditions. All that is a sign of progress. The kitchens have been put in the basements and in the least desirable part in the house because the kitchen work has so long been considered drudgery. When we get to the point of making the kitchen the pleasantest room in the house, sunny and light with plenty of air, with a stove which does not develop so much heat that it drives everyone out of the room and then have this kitchen furnished with suitable appliances for work, we shall find that the kitchen work will be less drudgery, and a great many of the perplexing questions of the day will be settled.

I have spoken of the use of the butter or fat in the bread, that it was better to melt the butter in the warm liquid instead of rubbing it into the flour. Now there are certain other cases where it is much better to rub it into the flour. And first of all we must consider why we put butter into these different doughs. Away back in the past, hundreds of years ago, just when I can hardly tell, as these nursery rhymes are rather difficult to trace, a verse was written, that we all know, about the pudding that was made with "lumps of fat as big as my two thumbs!" etc. That might have appealed to people less refined than we consider ourselves to-day, but it does not generally attract people now. Where suet was a common form of fat in doughs one or two hundred years ago, there is less use for it all the time. Clarified fats or butter have very largely taken its place. The only objection to the use of butter in all these cases is that it is an expensive form of fat, that the fat of beef and the fat of the pig (lard) are cheaper forms of fat; but what I say about butter will apply equally well to those cheaper forms of fat. While butter is a luxury, it certainly is a very wholesome luxury. It is good for us to use it in moderate quantities, and we may be safe in using larger quantities of fat in cold weather than at any other time. Butter is not a perfectly pure fat, as all of us here know. There is more or less of water and casein about it, and therefore it takes as a rule, more of butter than of other fats to make a given amount of shortening in a dough. Lard is prepared in such a way, that there is little or no albuminous matter remaining, while in butter there may be from three to five per cent ,and possibly in some case more. The water is also a variable quantity. If we melt a cupful of butter we find a clear yellow oil on top and a curdy sediment at the bottom. In very hot countries the butter is melted in this way and the oil poured off. If we have an inferior grade of butter, (I suppose it is out of place to speak of butter of an inferior grade in such a place as this, but occasionally some of us are unfortunate enough to have some,) if we melt it and pour off the fat, that part may be perfectly sweet, and the curdy matter at the bottom be all that is troublesome.

Bread is more easily handled and shaped when slightly warm than when very cold, but in handling a dough which has a large amount of butter in it, whether it be pastry or cakes, we shall find great difficulty in handling it if we have allowed it to remain at such a temperature that the butter can be turned into an oily, soft fat. Therefore we find it better when we make such things to keep the butter as cold as possible. And in pastry making it is quite common to chill the butter with ice, because there is such a large quantity used. In that way much of the difficulty in pastry making is removed. Really the best rule that can be given is to keep everything cold, with that precaution one never need have any trouble in pastry making. But when we attempt to make pastry in a warm kitchen, and the butter or fat squeezes out on the board when we roll it out, we cannot expect to have light pastry. When we put pastry in layers, putting little bits of butter all over one layer and sprinkling a little flour over it, and then folding it in layers, if the butter is soft, those layers stick close down together and when we roll them again they either slide off or the butter oozes out. But if the butter is cold more or less air is folded in, and by rolling gently we get a number of fine layers of dough, with butter and air in small quantities, between them. Now the colder the air is the more it expands, and if the air is ice cold we get that very light, flaky pastry, which is the only kind we ought to have.

You know there is a great deal of criticism made upon us New England people that we are, too largely, pie eaters. Mr. Rudyard Kipling had a great deal to say last winter about his residence in the pie belt, and perhaps that belt extends far enough to take in Maine. I am not sure that such a combination of butter and flour as pastry would be at all desirable to give to a person with a weak stomach, or for a steady diet, but there is no objection to pies occasionally if the ingredients are mixed in such a way that the particles of flour are perfectly baked. There must be air to separate them in order to secure that result.

I have shown in regard to pastry that it is very desirable to have the butter as cold as possible, and that would hold true with cakes, and with any doughs where there is a large amount of butter used. In cake-making we cream the butter in order to secure as much air as possible. If we melt the butter and put it into the cake we shall find that it has a tendency to hold down the air bubbles of the eggs, but if the butter is rubbed until it is creamy there is enough albuminous matter about it to catch and hold the air bubbles just as whipped cream catches and holds air bubbles. So when we make cake we begin with warming the bowl slightly because if the bowl is cold it may be difficult to rub the butter until it is creamy; then we begin to work very gradually, rubbing the butter, with a wooden spoon preferably, and then gradually adding the sugar to that. Many persons put butter and sugar together into a cold bowl, and then wonder what is the matter that it takes so long to mix them.

There is another class of doughs where we usually find it best to rub the shortening into the flour, and that is the dough which is made light with baking powder, or cream of tartar and soda or sour milk and soda. With dumplings in soups, fruit dumplings, and all those doughs in which we use only a small quantity of shortening, perhaps a tablespoonful to a quart of flour, it is a difficult matter to rub the butter into the flour so that it is thoroughly mixed. We may melt it and mix it with the liquid, but

The A. J. C. C. herd of C. F. Cobb, So. Vassalboro, headed by the noted bull, Fancy's Harry 7th.

wherever the dough is to be handled or rolled out on the board, we gain by having the mixture just as cold as possible, and even the melting of the butter will make a difference there. With batters and soft doughs it does not make any particular difference whether the butter is put in in one way or the other. We may find it necessary sometimes to use a cheaper form of fat, but it is desirable to be very careful about the use of butter substitutes. The use of inferior fat is one of the ways in which we get very objectionable flavors in our cakes or pastry. I wonder if we have not all been able to distinguish between baking powder biscuit where a large quantity of lard is used, or where butter is used in the dough. We shall find that in many cases too much shortening is used in our mixtures of that order. A corn cake or a muffin that has much shortening in it will fall to pieces when one attempts to butter it. It seems to me that that is a case in which it is far better to have the fat on the bread than to have so much in the dough at the beginning. There are two reasons—it is not as easy to serve on the table with a large amount of shortening in it, and the shortening tends to hold it down and prevents it from being as light as it would otherwise be.

The buns which I have made are after the same general plan as the bread, but with more butter and considerable more sugar in them. Sugar and butter are rather solid heavy substances, and when we get a large amount of those things in the dough it tends to hold it down and make it heavy. And the yeast does not work as rapidly where it has too much butter and sugar put with it, therefore it is well for us in all these doughs to use less shortening, even, than the majority of recipes call for. I find very few recipes calling for a cup of butter, in which three-quarters of a cup is not really an improvement. And when we plan in that way to use less shortening in the doughs, the expense is not as great, and we can have a better quality of fat in the doughs.

There is one other point which does not connect itself with our subject to-night but has a bearing on it, and that is the combining of flavoring with butter when it is used for sandwiches and for similar purposes. In many of the French cook books we find recipes for seasoned butter in which butter is creamed and then some flavoring ingredient added to it. Chopped parsley is one of the most common things that is used in this way. We often see it spread over steak. The butter is rubbed until it is creamy and then mixed with chopped parsley and a little lemon juice and spread over the hot meat. It melts and gives a good flavor to the meat. In the same way various sorts of butter may be made by adding different herbs and seasonings.

Some have carried this a step farther, and when they have wanted butter to be particularly fine, to make an aesthetic form of sandwiches, or that sort of thing, have put it for a time into a jar of rose leaves, or violets so that it will take the perfume, and then buttered the bread. It is often desirable for our ordinary use to combine finely chopped meat with butter and then spread the bread with this, instead of spreading it with butter and putting on a slice of meat.

While talking about the question of butter in this meeting it seems hardly fair to neglect cheese altogether. Cheese is a still older form of preserving milk, it is mentioned by the old writers before butter. It seems to me that there are a great many ways in which we might use cheese where we do not ordinarily.

I would have been glad in connection with the talk to-night, to have taken up some of the uses of stale bread, also; because that is always one of the problems in connection with bread. The best way to do is to plan so well that we shall not have any stale bread. I think that can be done, and yet sometimes it is hard to reach that point, and a great deal of bread is thrown away because it is stale and people do not know what to do with it. I do not think there is as much difficulty in the country towns as in the city, because in the country towns we all have some animals to which we can feed the bread, and it is not the loss that it is in the city. Over and over again I have seen half loaves of bread in the garbage barrels as they were being emptied. That, of course, is a great waste of food material. There is no particle of bread but can be used in one way or another if we only plan rightly.

It has been possible this evening to touch upon this subject in only a very fragmentary way because it is such a large subject. I have tried to show some of the especial points, and what I would like to emphasize in leaving it is that in bread-making, and in all these other doughs, the important points are often disregarded

The main thing in the bread making is to have the dough mixed at the proper temperature, and to keep it at the proper temperature while it is rising, and when the yeast has done its work kill it as quickly as you can, and be sure that the bread is baked and the yeast killed.

I was so unfortunate a few months ago as to fill, in regard to bread, some such position as Mr. Harris has filled here in regard to butter. The gentleman who asked me to do this said they wanted somebody from out of town who could leave by the first train after the awards were given out. That was my first experience with as large a quantity of bread as I had to handle, but I profited somewhat by having attended various dairy meetings and other meetings of that order where I found there was a certain scale of points to be observed, and I tried to arrange some scheme of that sort that would help me in judging the bread. The first thing I looked at was the general appearance of the loaf. I could tell from that whether the person who shaped the loaf knew how to handle the dough easily to get a good shaped loaf or not, and that told something about the baking and the general quality. Then the loaf was cut through the middle. The majority of the loaves that were on exhibition were about twice as large as they should have been, so that the center of the loaf in many cases was not properly baked. Often we find large loaves of bread falling apart in the center, that indicates too much rising. The weight of the bread carries it apart in the center and the result is not good. After that I would endeavor to tell something by the odor of the bread, and in that way it was very easy to sort out those loaves which were approaching sourness. And then it was not a difficult matter to decide as to the flavor of the bread. I think we, as housekeepers, have not thought enough about these different points. Each of us has established a standard of her own, but unfortunately we do not all agree about them. It seems to me that it is quite necessary that we should attempt to get at some more definite standards, not only in regard to bread-making, but in regard to many of these points, and we need greater co-operation in housekeeping affairs. I am always very glad when there is an addition of this nature to a meeting of the farmers.

The buns are now ready to be taken out of the oven. They have been baking about an hour, and have browned very uniformly. They are not quite as brown on the top as they would have been if they had been placed a little higher in the oven. A final finish for these buns would be to rub them over with a syrup of sugar and water, and set them back into the oven for a few moments to brown still more. I shall now be very glad to answer any questions that may be asked.

Ques. I noticed you mentioned the use of baking powders and the use of yeast. I would like to ask if you advise the use of baking powders?

Ans. It is an advantage to use those things occasionally for emergencies. My own preference is for yeast bread for the main dependence, but occasionally baking powder bread is to be preferred.

About a year ago, or perhaps a little more, a series of advertisements were printed in different papers where they did not appear to be advertisements unless one read very carefully; and these letters or articles, whatever we might call them, were very wholesale condemnations of yeast bread. The very worst form of yeast bread was contrasted with the best possible form of baking powder bread, much in favor of the baking powder bread, and at the end of the article the name of a well known baking powder was mentioned. Many of the best authorities on food agree that baking powder is a useful article, and is, on the whole more reliable than cream of tartar and soda, because the two are mixed in exactly the right chemical proportions. But of course we have to pay the manufacturers for mixing the ingredients for us.

Ques. Are there any dangerous or injurious ingredients in the baking powders?

Ans. In many of the low grade or cheap baking powders there might be danger of this.

Ques. Can you tell us what these ingredients would be?

Ans. Of course they vary very much in the different baking powders. Sometimes the powder is simply diluted with too much starch. A certain per cent is always allowable, but sometimes so much is put in that a large quantity of the powder has to be used to do the work, for starch will not make anything light. Alum and ammonia are also used, which most people do not regard as wholesome, though there are differences of opinion, and other substances are used, which may or may not, be harmful.

Ques. What did the thermometer which is attached to the oven indicate?

Ans. It was not far from 300 degrees.

Ques. Can you bake beans in that oven?

Ans. It is very good for that purpose. The effect of the Aladdin oven is more like the slow, gentle cooking of the brick oven than it is like the ordinary stove oven. It is particularly good for beans, brown bread and tough meats, and dishes of the custard order, cereals and mushes. Of course with a powerful lamp raised to its full height a high result can be attained, but even then a little longer time is required than in an ordinary stove oven.

Adjourned to Friday A. M.

SECRETARY B. W. McKEEN.

Mr. CHAIRMAN, LADIES AND GENTLEMEN: I regret very much that we are unable to fully carry out the programme of the morning, but it appeared to be impossible when we came to view the difficulties which we would have to surmount in order to do it.

I wish to use just a few moments of time before Prof. Jordan begins his lecture, to call your attention to some of the work that we have tried to illustrate to you at this meeting. When these Dairy meetings were first instituted by the Board we showed, (I think it was at Winthrop) one small separator which was turned wholly by hand power. It was the best of the kind that was then upon the market or was known to manufacturers. Since that time investigations have been constantly going on and experiments have been made along all lines of work. Demands have come from different departments of our farm work for improved machinery, and we are now able, upon our stage at this meeting, to show you four different separators in motion, any one of which is capable of doing far better work and far more of it than the machine that we showed at Winthrop a number of years ago. This shows the great advance along the line of dairy work. Shoulder to shoulder with the advancement that has been made by our investigators, experimenters and manufacturers, has gone along investigation upon our farms. The demands of the times, the necessity for making a better product, the necessity for keeping abreast with other branches of business, has set our farmers to thinking, and to working in the way that has created a demand for all of these different machines.

And we are also able to present to you at this time for careful investigation some things which appear to be almost entirely upon a new line of thought. Those of us who are familiar with our dairy literature are aware that the invention and putting upon the market of the Babcock test marked a new era along our road in dairying, practically; that the use of that machine has extended all over the different sections of the country. But we have shown you here a new invention, called the butyrometer, an invention which, while it works upon the same principle as the Babcock test, may have some advantages over it. And it may have disadvantages which upon careful investigation will condemn it, but it certainly calls for such investigation. Simply because a machine is new, is not evidence that it should be apopted. Simply because a machine is old is not evidence that it should be thrown away; but he who would keep abreast of the times, keep bright and garnished for the work, must be prepared to throw aside prejudices, preconceived notions, and give to all these new machines careful thought, study and investigation, so that he is able to view them with an impartial eye, take their advantages, and use them if it appears to him to be to his advantage to do so. The Russian milk tester is also a different arrangement, though working on the same principle as the Babcock. It is for the purpose of having our thoughtful and intelligent dairymen in Maine investigate this matter that the machinery has been brought here. As a representative of the agricultural interests of the State I have been very much interested in the matter. I believe that the farmer has got to do more of his work in the future with his brain and less with his hands, and to that end I like to see our farms supplied more and more with some simple machinery like the engine, the tread power, and the steam jet arrangement. And while we are looking into these labor saving machines for the farms we are also looking for labor saving machines for our homes; and we have been shown the invention of Edward Atkinson, which it seems to me will lessen very greatly the disagreeable part of the preparing and cooking of food for the family. We ask you to carefully consider these things and to note also the fact that in no industry in which man is engaged to-day are there so many active, earnest men working along practical and scientific lines, and making investigations into newer methods, into the best means for performing work, as in our dairy industry.

I hope that the showing of this machinery, and the examination of our butter by our expert may be of great practical advantage to us. I congratulate you, dairymen, on the result of the scoring of your butter as compared with one year ago. It was with very much pleasure that I listened to the remarks of Mr. Harris yesterday. In looking over our premium lists I find that while there is no single exhibit of butter which scored as high as one did last year, the average is very much higher and the prizes are going to be very much more extended.

Mr. VINTON—Mr. McKeen has suggested one thought to me which I want to call your attention to. We do not want to destroy any veneration for our fathers and grandfathers, but I have found in talking with farmers, this idea that they know it all. They say our fathers and our grandfathers did so, and don't you think they knew about these things? I believe that that idea is of positive injury to our farmers to-day. As far as we act upon that principle we are going backward instead of forward. The farmers of Maine must admit the fact that they can have no success to-day unless they advance and improve upon anything that their fathers and grandfathers had, however good it was. The farming of to-day cannot be run in the groove of our fathers and grandfathers. That idea absolutely kills agriculture. Let us kill that idea and arise and make progress.

THE RELATION OF THE FOOD OF MILCH COWS TO THE QUALITY OF THEIR PRODUCT.

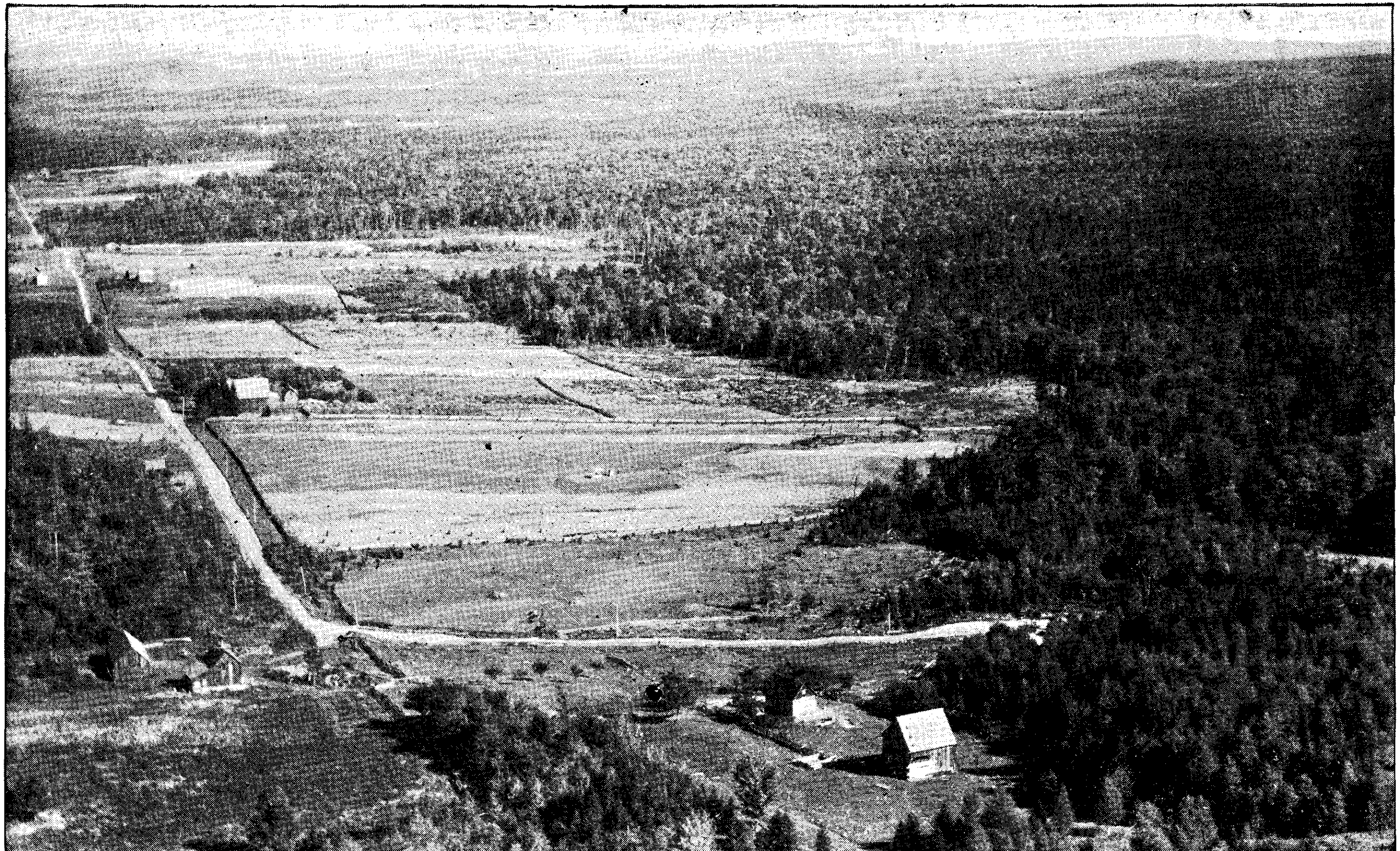
By W. H. JORDAN, Director Experiment Station.

Stenographer's Report.

MR. CHAIRMAN, LADIES AND GENTLEMEN: This is not the first time that I have had the pleasure and the honor of looking into the faces of some of you while engaged in Institute work. Twice before, I believe, I have been here in Norway Village, and have very much enjoyed the energetic, live, and at the same time thoughtful way in which you have come to regard agricultural matters. When I was here at one time a subject came up for discussion, which is an old subject (I have not anything very new to bring before you, I have not the advantage of novelty,) concerning which I expressed certain opinions and they did not meet with a very favorable response on the part of some of your intelligent farmers. I made the statement that in the production of milk the cow is the chief factor; that between the food and the product stands the cow, as the loom stands between the wool and the cloth. As the loom will weave its peculiar product, so will the cow with her complicated machinery weave her peculiar product, and it is not possible for the farmer, outside of narrow limits and excluding abuse and starvation, to turn out any sort of product that he pleases from that loom. And I come here to-day to re-affirm my position, in a way. I have come somewhat in the attitude of a judge, to charge you with the testimony; to interpret to some extent the testimony as I understand it. I shall not pretend this morning that we know all about these things. The distinguished gentleman from Wisconsin who is with us to-day, and who was with us at the first Dairy Institute that was ever held in Maine, said at that time, and I have never forgotten it, that the darkest place in this universe is the inside of a cow. I suspect he stretched the facts a little for the sake of being forcible, but he expressed a great truth when he said, or practically said, that when you deal with the physiological and chemical processes of the animal you are dealing with some of the most mysterious and delicate questions that come to science.

So I shall not be so foolish, friends, as to come to you this morning in this presence and say that I, or those that are much wiser than I, know all about this question of how the animal does her work; but there are certain facts which I do wish to bring before you. It may seem to you, possibly, that this question should not have been taken this morning for discussion, because it is such an old one, but my reason for selecting it when I was asked to choose a subject to speak upon at this time was that I am in constant receipt of inquiries from farmers such as this: "How shall I feed my cows to produce a great quantity of milk?" Or again, "How shall I feed my cows so that they may produce milk rich in butter fat?" I have never yet been asked to feed cheese into a cow, though I rather expect I shall be before long, if what I say this morning is not believed. I have almost expected that the farmer would want me to tell him how he could so turn the crank of the food that he could almost milk cheese out of the cow's udder. I am receiving inquiries in behalf of one of the papers of the country, and those inquiries are constantly bringing to me these questions: "I want the greatest quantity of milk, I do not care much about the quality," or "I am furnishing milk to a butter factory and I want the largest amount of butter fat." Because the farmers of the country are asking these questions, because they have certain notions which I believe to be largely erroneous, I selected this subject.

What is the scientific view? I do not know as I ought to be the interpreter of science on this point, but I shall make bold to give you this morning what I undertsand to be the view that men hold who have made something of a scientific study of this question. I believe that the majority of the men who have studied these questions of animal nutrition believe that when you have bred an animal along a long line of ancestry, and have by a certain course of feeding, either good or poor, brought that animal up to somewhere near the period of maturity, you have an animal with a definite constitutional capacity which you may not change at will. That capacity may involve the beef-making power, it may involve the milk-producing power, the power to produce large quantities of milk, or the power to produce milk of a characteristic quality. And the decision is, as I understand it, that after the farmer once acquires that animal he has a machine which he cannot transfer at will from that kind into another. That even holds, I believe, in regard to the individual, as well as to the breed. Animals have individuality as well as breed quality, and you cannot transfer the indifferent, stupid cow into the nervous, active, productive cow by any sort of feeding or any sort of manipulation. Science is willing to admit certain changes, of which I shall speak; but she does not admit that these changes are so intimately and directly related to the mere matter of the manipulation of food as the many farmers appear to think. Now there are reasons for this, what I may call the practical, view, that milk is under the control of the food to quite an extent. Whenever I find a wide spread belief, to which men persistently hold, I am inclined to respect it; at least to the



View from Haystack Mountain in Castle Hill, showing the towns of Mapleton and Presque Isle, and Chapman Plantation, with New Brunswick in the distance. The road shown is the road from Presque Isle to Ashland.

extent of not saying that it is not a true belief until I have some weighty facts with which to combat it. And I think that should be the attitude of every man who occupies the place that I occupy. He should be very slow to say to the public in any matter which affects them socially, intellectually, or financially, "You are wrong." One of the weaknesses of a certain amount of experiment station work in this country, if I may be allowed to criticise, is that the stations are making premature declarations, and the public may be deceived. May the Maine Experiment Station, with all its frailties and weaknesses, never fall into that error, if we wait years for results.

Now there are reasons for this practical notion, I call it a notion, perhaps I should dignify it by the term belief. One main reason is that the product of the cow does change in character. There are great variations with the same animal in the same year, under very nearly the same conditions. It has been our duty, as well as our pleasure, at the Maine Experiment Station, to study the milk of quite a large number of animals for almost every week of the year during several years. What do we find? We find that to-day the cow Agnes, for instance, has 4.75 per cent of fat in her milk, and to-morrow only four and one-half per cent. I have known as great a difference as one per cent between the milk of two consecutive days. Now don't ask me why; that is where you get into that dark place in the cow. I do not know anything about why the cow is not able to tell us. If the dumb creature could speak, and speak intelligently, that is, in self consciousness, we might learn more than we have ever learned before. I do not know why there is this difference, I only know the fact, and I shall have to leave the interpretation to future investigations. Then again, we found that our cows differed according to the stage of the milking period. First of all we found that for two or three weeks after they became fresh the milk was richer than it was later on. Then for a few months afterwards so long as the quantity of milk was not diminished the quality remained practically unchanged. Then after holding at that point for a time, we found that with a decrease in the quantity of milk, there was an increase in quality. We found these changes and others for which we could not account.

Now I believe, friends, that the fact that milk changes in quality in these ways is the reason why so many of us begin to think that when we change the food we find a change in the quality of the milk. The change in food and in milk are often coincident, but not related. That may not appear reasonable to you, but it is evident to me.

In order to understand where we are, we want first to understand what milk is and how it is made, so far as we know. Milk is a liquid that contains, as the cow gives it, a varying quantity of water; and after the milkman gets it the water varies again, often.

As the cow gives it the average amount of water is about eighty-seven pounds in one hundred pounds of milk, and there are thirteen pounds of milk solids, solid matter that is not water. What do these solids consist of? Well, if I were to burn those solids I would find some mineral matter, an ash similar to the ashes in a fireplace, out of which the calf makes his bones. Then if I were to take whey, for instance, and go through a certain process of separation, I should find a quantity of sugar. We buy it in the drug stores under the name of milk sugar, and feed it to infants. I would find also by further investigation with the addition of an acid that the milk contains a curdy matter. That is the casein, which gathers up the fat with it at the same time that it changes into curd. It is the cheesy matter. Where do all these substances which are contained in the milk come from? Right here comes in another reason why I think the agricultural public has come to believe that the food has a great deal to do with the constitution of the milk. The idea prevails that the milk is somehow derived directly from the food, being filtered out of the blood simply, that the food which you feed the cow to-day is somehow transformed directly into the milk by simply separating the fat, the albuminoids, the sugar, the mineral matter, etc., of the food and putting them into the milk. Some of these materials do finally reach the milk, but the cow stands between. I cannot to-day go into the question of the detailed structure of the cow's udder, though it is a question that I have interested myself in very much, and about which I have read more or less. The belief to-day, and it has a most excellent foundation, in my judgment, is that the milk is first built into the structure of the cow, built into the tissue of her udder; that this structure, stands between the food and her milk. There are sound reasons for believing this, so far as certain constituents of the milk are concerned. One of the reasons which I will mention is this; when an animal in full flow of milk is killed or rendered unconscious by chloroform and a dissection of the udder is made, it is found that away up at the end of those little tubes that run up from the main opening in the udder, where there is a little cellular cavity, the tissue appears to be in the process of being carried over from albuminoid matter to fat. Little particles of fat are in the act of breaking off. It is like what we call fatty degeneration of tissue. We have not proved to a mathematical demonstration that this occurs in the cow's udder, but the examination with a microscope, and the related facts which we do know, give us sound reasons for thinking, as I have said, that the food is first built into the tissue of the cow, which tissue breaks down to form certain milk solids, and this to me is one very good reason why the cow will control the quality of the milk. She builds tissue that is her own, she does not build tissue for any other cow. The Jersey type does not build tissue for the Ayrshire type nor the Ayrshire for the

Holstein, but for hundreds of years they have been building their own peculiar structures. And that is true of the individual. There are persons who may eat as much as they please and they will always be lean; they would be delighted if they could eat enough to be fleshy. There are others who would give half their incomes if they could prevent themselves from getting so fleshy on what they eat, but they cannot seem to stop it. And you cannot stop a cow with any reasonable kind of treatment, from using food in her own peculiar way. That is why I believe the cow produces milk that is peculiarly her own.

How does milk vary? First, it varies by having more or less water in it. The milk which the Holsteins give is on the average very much poorer in solids and richer in water than that which the Jerseys give. The milk which your fine Jersey cow is giving now, she having become fresh in October, is very much richer in water and poorer in solids than it will be next August or September, when the quantity which she gives has diminished to two or three quarts and she is about to become a mother again. You will find those variations in the amount of water which the milk contains.

Now milk not only varies in the amount of water, but we must consider also the possibility of its varying in the proportion of the constituents of the solid matter. The milk contains mineral matter, sugar, fat, and albumnoids. Now the possibility which we must consider is whether by certain feeding we may put in more fat and diminish the other substances; or may put in more casein, cheesy matter, and diminish the other substances.

Milk may also vary in flavor, but I shall not touch the flavor question to-day; that is too much for me. I touch that subject gently and discreetly in a meeting of this kind. If Governor Hoard is willing to tackle the flavor question I wish him well.

Milk may also vary, so far as it is a question of production, in the amount. I shall not discuss the question whether one ration will produce more milk than another. That would be foolish, we all know the facts. I shall confine myself, in regard to changes in the composition of milk, to the first two considerations, the proportion of water and the proportion of the constituents of the solids.. I shall leave out of the question starvation and abuse. Those are not reasonable things to consider. I am only going to consider feeding within reasonable limits. I am willing to concede that if the boy throws rocks at a cow, if you cultivate her with the milking stool, worry her or lose your temper and strike her, keep her stirred up all the time and abused, there is a great chance because of the disturbance of her nervous system through the action of which milk formation is carried on, that you may materially modify her product. I do not know that this is so, but I would think it possible. I am willing to allow that the period of lactation modifies the quality of the milk, and possibly temperature may, although those who have studied that question have been unable to find that temperature does modify the cow's milk. This has been investigated more in Vermont than anywhere else that I have noticed, and there they have been unable to find that a cold day, or several cold days as against several warm days have any marked influence, always one way, on the milk.

Now, how may the food vary? The food may be varied by feeding more, and you may feed more in two ways. You may feed more by feeding more by actual weight of the dry food, or you may feed food containing varying amounts of water and thus vary the dry matter actually consumed. Or to put it more simply, we may feed watery food against dry food, or we may feed less dry food against more dry food. We may vary the food by varying the quantity, or we may feed foods varying in the substances they contain. If I make up a ration to-day of clover hay, cotton seed meal and bran, and to-morrow Timothy hay, bran and corn meal, I have made up different rations even if I feed the same quantity, because in the one which I make up to-day I have put a great deal more of what we call protein, and also more of what we call fat. So that we may vary the food in a marked way by varying the relative amount of protein that goes into it, as well as by varying the proportion of fat.

Now I come to results actually reached. I undertook last week to go through the entire station literature of this country and some of the German, to find out exactly what the testimony is on these points under discussion. As I told you, I have come here somewhat in the attitude of a judge charging a jury. I shall present to you the testimony and let you draw some conclusions for yourself. I have on one side of my library the station literature by itself, and it is getting to be voluminous. I took down from this alcove in my library almost the complete publications of every station and went through them all, consulting all the feeding experiments that could possibly give decisive testimony on this point. I did not pay any attention to many feeding experiments because they were not so planned as to give reliable testimony in regard to this matter. It means a great deal to plan an experiment so that it will furnish testimony that is worth something, and that is one of the things which the great public has not yet fully comprehended. The discovery of a truth means a great deal in the way of severe investigation and experiment. I selected from this literature those experiments which in my judgment might be taken as furnishing fairly reliable testimony on the points under consideration.

First, then, the German work. Away back in 1868 this question attracted the attention of the Germans. They began to think about this matter, whether the product of the cow could be manipulated at will, whether we could feed fat into the milk or feed it out of the milk; and so Kuhn conducted an extensive series of investigations. He had twelve series in all, involving forty-eight experiments with eight cows. The periods that he fed the same kind of fodder were from twenty to forty days. He fed a normal ration, consisting of twenty to twenty-two pounds of straw and forty pounds of beets, in some periods, to which in other periods of feeding he added bean meal and oil meal and various other nitrogenous foods. Now the conclusion of Dr. Kuhn was that while the milk varied, varied while he was feeding the same ration, varied from one ration to another, and also varied during the period of lactation, the milk becoming richer the longer the cows had been in milk, he could not control the product, but that the cows would give their peculiar kind of milk independently of the food, because of certain other influences which he could not measure. I have not all the results with the eight cows from the forty-eight experiments, but I have certain typical ones, and I have tried to be fair and just in my selection of them. I did not take those that met my own view, particularly.

GERMAN EXPERIMENTS.

Cow I.	Total solids.	Fat.
Normal ration	11.13	2.98
Normal ration plus 3.5 pounds bean meal	11.37	3.15
Normal ration plus 7 pounds bean meal	11.83	3.35
Normal ration	11.39	3.11

GERMAN EXPERIMENTS—CONCLUDED.

Cow III.	Total solids.	Fat.
Normal ration	11.61	3.12
Normal ration, plus 7 pounds bean meal	12.31	3.45
Normal ration, plus 7 pounds bean meal and 1 pound oil	12.37	3.42
Normal ration	12.25	3.40

In the first series he had four cows, and I put down on the first sheet what he did with one of them. He fed only this normal ration of beets and straw, and got milk which contained 11.13 pounds solids in a hundred pounds, and 2.98 pounds fat. Then he added three and one-half pounds of bean meal, and got 11.37 per cent. of solids and 3.15 per cent. of fat, a little better milk and a slightly better per cent of fat. He then went up to seven pounds of bean meal, and got milk containing 11.83 per cent. solids and 3.35 per cent. fat, and then back again to his normal ration, and got 11.39 per cent. solids and 3.11 per cent. fat: just a little poorer, but not much.

With cow number three he made a very striking change in the food. On the normal ration the milk contained 11.61 per cent. solids and 3.12 per cent. fat. He added seven pounds of bean meal and got 12.31 per cent. solids and 3.45 per cent. fat. Then he continued in the next period the same amount of bean meal and put in one pound of oil a day and got 12.37 per cent. solids and 3.42 per cent. fat.

The other day in the "Country Gentleman" a writer who has written for that paper a great deal said that it was a well known fact that when we fed fatty foods we fed fat into the milk. That does not look like it, does it? Kuhn put a pound of oil into the food but it did not get into the milk. Then he dropped back to the normal ration again and had practically the same milk that he had during the other periods. While there are slight changes in the percentages in this case, there are no changes that mean very much in the controlling of the quality of the milk, that is, the feeding up and down as we please.

In Connecticut, experiments were made in feeding varying kinds of soiling crops, clover against the grasses, and they were unable to find any change in the milk in passing from one soiling crop to another.

ILLINOIS—1893.

THREE COWS.	Amount grain—pounds.	Total solids—	Fat.	
Tests for 278 to 342 days.	2	12.98	4.01	25 days.
Constant analyses.	12	13.34	4.29	12 days.
	16	13.20	4.06	15 days.
	20	13.29	3.86	51 days.
	24	13.43	4.05	6 days.
	12	13.22	4.03	16 days.
	6	14.15	4.75	

In Illinois an experiment was made which was continued for 278 to 342 days, with six cows. The experiment was conducted by a graduate from the Maine State College (whom they have taken out to Wisconsin, where they take lots of good men and keep them) Prof. Farrington. He did his work in a very thorough manner; I was rather proud of the fact that a Maine State College boy had learned to do his work so thoroughly. What he did was this;—he began with two pounds of grain daily on December 1st and increased that gradually so that on February 27th he was feeding the cows twenty-four pounds of grain daily, without very much variation of the coarse food. On April 8th, after feeding that tremendous ration for fifty-one days, he began to diminish the grain. We are to see if these changes had any marked effect. They did not. The richest milk was produced on the small grain ration at the end. The grain was mixed grain, containing nitrogenous foods, and the same mixture was fed all the way through. Let me say that Prof. Farrington made constant analyses of the milk, he analyzed it every day. I give you this experiment to show that while the cows made vastly more milk when they ate twenty-four pounds of grain, they kept right on weaving the same kind of product, the proportions of solids remaining the same.

IOWA—1891.

PERIODS 21 DAYS.

Corn and Cob Meal vs. Gluten—Coarse Food not Changed.

FOUR COWS.	Total solids.	Fat.
Corn and cob meal	11.87	3.37
Gluten	12.60	3.95

Now when we get down to Iowa we have the only experiment which ever worried me any. In that state two experiments were made, in both of which the corn products were fed against what they call sugar meal,—gluten meal. The professor who made the experiment and whom I happen to know personally, knowing my general view, sent me a report marked in various ways, in a sort of jubilant spirit, as though he had settled me for all time. I began to think that possibly I would have to revise my views and go to the farmers of the State and say, "I am mistaken, badly mistaken." In Iowa they fed in periods of twenty-one days, twelve and one-half pounds of corn and cob meal against ten pounds of gluten. I do not know what kind of gluten it was, but it might have contained thirty-five per cent. of protein against ten per cent. in the corn meal, as gluten is a very nitrogenous food. The four cows on an average, gave when fed on corn and cob meal, milk containing 11.87 per cent. solids and 3.37 per cent. fat. The average when fed on gluten was 12.60 per cent. solids and 3.95 per cent. fat. You see that is quite a change. These results are the most extreme of any that I know of on record which suggest the possibility of manufacturing the kind of milk you please. I present them to you as the strongest argument I know of in the way of a single experiment favoring that side.

IOWA—1891.

SIX COWS.

Corn vs. Gluten.		Soiling (stable) vs. Pasture.	
GRAIN RATION.	Fat.		Fat.
Corn and cob meal	3.45	Stable	3.48
Gluten	3.53	Pasture	3.63
Ear corn	3.61		

The next experiment in Iowa is not labelled an experiment to determine the effect of food on the quality of milk. I have examined its teachings pretty exhaustively to see what was done and what were the results. This is a mixed experiment, which is generally not of the best kind. It is usually better to hunt for one thing at a time. In this trial they had six cows and put three in the barn and fed them on soiling crops, and put the other three in the pasture. Then when those in the barn were put in the pasture, those in the pasture were put in the barn, about the middle of the summer.

All of these cows had, until July 14th, corn and cob meal. On July 14th they began to give them instead of twelve and one-half pounds of corn and cob meal, ten pounds of gluten, and on August 8th they changed from gluten to ear corn. They made exactly the same changes so far as the kind of food was concerned, that they did in the previous experiment, (experiment 4) only the cows were also eating green food, a soiling crop or pasture grass. We simply have the percentages of fat, which, while the cows were being fed on corn and cob meal, was 3.45; when fed on gluten, 3.53. When the cows were fed again on the ear corn, the percentage of fat was 3.61. The average for the cows when they were in the stable, was 3.48; in the pasture, 3.63. If I were a lawyer I would pit one of these Iowa experiments against the other and let the jury fight out a conclusion.

MASSACHUSETTS—1894.

PERIODS 21 DAYS.

Cotton Seed Meal and Gluten, vs. Corn Meal. Protein Varied 2.60 Pounds to 1.30 Pounds Daily.

SIX COWS.	Total solids.	Fat.
Cotton seed meal and gluten	13.70	4.56
Corn meal, mostly	13.48	4.18

I have another experiment which looks a little like an effect of food on milk. Governor Hoard told me last night that he had a discussion with the gentleman conducting this experiment, Prof. Lindsey of the Massachusetts State College. By the way I want to compliment Dr. Lindsey as a man who is sure to do us good. He is a hard working, well trained man, and I have no criticism to make of him. In the Massachusetts feeding experiments previous to 1893, for some reason which I cannot understand, only a single day's milk was taken for analysis. I shall ignore these experiments. In 1893 the Massachusetts Station compared the effect of rowen, pea and oat hay, and bean silage, and found no effect on the quality of milk in changing from one to the other. In 1894 Dr. Lindsey took the situation by the horns, and with six cows made three sets of comparisons with each of them, using a very heavy nitrogenous ration made up of cotton seed and gluten meal, against a ration containing mostly corn meal with a little bran. I have analyzed the results, studying each cow by herself, and I found that of the eighteen comparisons, in eleven cases he got richer milk with the food containing more protein, the cotton seed and the gluten, and in seven cases he got poorer milk. The average is one way, as you will see, but I am speaking of individual cows. In seven cases the change in solids was less than one-tenth of one per cent. and that does not mean anything because the chemist has to hustle to get less than one-tenth of one per cent. as an error, and in twelve cases less than two per cent. In five cases the percentage of fat was as high, or higher, with the ration poor in protein, and in the other thirteen cases it was higher with the ration rich in protein and fat.

Ques. How was it in regard to quantity?

Ans. The quantity of milk was much greater with the heavy protein ration. In fact this is almost always the case. Where a man takes a food poor in protein and introduces cotton seed and gluten meal, you will scarcely ever find an experiment in which there is not an increase of milk.

Now what are the averages which he obtained. The milk from the ration rich in protein contained 13.70 per cent. of solids, against 13.48 per cent. in the other ration, and 4.56 per cent. of fat against 4.18. That is not nearly so striking as the Iowa experiment, but there is something of a variation. I give you the testimony as I find it.

MAINE—1895.

PERIOD 28 DAYS.

Cotton Seed Meal vs. Corn Meal.

THREE COWS.	Total solids.	Fat.
Period 1. Cotton seed meal, and corn meal	14.21	4.89
Period 2. Corn meal	14.66	5.15
Period 3. Cotton seed meal, and corn meal	15.12	5.40

MAINE—1886.

PERIODS 28 DAYS.

Cotton Seed Meal vs. Corn Meal.

THREE COWS.	Total solids.	Fat.
Period 1. Cotton seed meal, and corn meal	13.96	4.54
Period 2. Corn meal	13.90	4.63
Period 3. Cotton seed meal, and corn meal	13.89	4.59

MAINE—1893.

PERIODS 28 DAYS.

Cotton Seed Meal and Gluten vs. Corn Meal.

THREE COWS.	Total solids.	Fat.
Cotton seed meal, gluten and corn meal,	14.10	4.73
Corn meal	13.53	4.34

Now we come down to Maine. In Maine, three experiments have been made which were so planned as to give testimony on this point. You will understand that in these experiments I am simply referring to the quality, showing the relation of solids to the hundred pounds of milk, as I have distinctly stated that in these experiments the richer the food in protein the more pounds of milk were produced, in nearly every case. In the first experiment in Maine, in 1885, a mixture of cotton seed and corn meal was fed against clear corn meal; in other words a part of the corn meal was replaced by cotton seed. The periods were twenty-eight days long, so that we fed three months. The cows began to show the effect of the advanced period of lactation and the milk grew richer right along, which did not mean anything so far as the food is concerned. You will notice in these tables that when the fat goes up and down the solids go up and down, and that is the point in question, whether we can bring the percentage of fat up, and of the rest of the solids down, so that the proportion of fat will be greater. You will find if you figure on these tables, that the general average will remain about the same. If you feed fat into the cow's milk, you will have to feed other things in with it. You cannot feed into the milk anything you please. We found in this experiment a steady increase in the quality of the milk as the cows were advancing in the period of lactation, and a diminishing in the quantity, somewhat, although the quantity in the two periods in which the cotton seed was fed was much greater than in the other period, but we got no change in quality which may be attributed to the food.

In 1886 we tried the same experiment, and here, I cannot understand why, we got a little diminishing in the quality of the milk right straight along, so far as the solids were concerned. We fed cotton seed with corn meal, then corn meal alone, then cotton seed with corn meal again. When we fed the cotton seed meal, rich in protein and much richer in fat, the cows kept on making the same kind of milk.

The third experiment does not look just the same way. I took three cows and I made very radical changes in the food. I fed almost pure cotton seed and gluten against corn meal. One of the cows was an old cow and began to fail a little so that I did not have quite as much confidence in the results so far as she was concerned. There was a change of almost four-tenths per cent. of fat, and a change of about six-tenths per cent. of solids. That does not mean a transfer from poor to rich milk, but it is something of a variation. Now, that experiment in Iowa, the one in Massachusetts and the last one in Maine, are the only three that I can find which furnish testimony that means very much as indicating that food controls the quality of milk. I am giving you as nearly as I can an exact statement of the work that has been done and the results obtained.

NEW HAMPSHIRE.

PERIODS 14 DAYS.

Gluten vs. Corn Meal.

TEN COWS.	Total solids.	Fat.
Gluten	12.9	4.0
Corn meal	13.0	3.9

NEW HAMPSHIRE.

Effect of Feeding Oils.

THREE COWS.		1.	2.	3.
Twelve ounces oil daily.	No oil	4.43	5.18	3.22
Daily rations without oil: Hay. Silage. Vetch. Oats. Middlings.	Palm oil	4.52	....	......
	Stearine	4.41	....	......
	Cotton seed oil	4.11	....	3.47
	Corn oil	....	5.48	......
	Oleo	....	5.19	......
	Cocoanut oil	....	5.34	3.09
	No oil	4.07	5.24	......

Director Whitcher in New Hampshire, made an experiment of the same kind. He fed gluten meal against corn meal with ten cows for a period of fourteen days. The fault I find with this experiment is that the periods were rather short. I would double their time at least. The experiments which farmers talk about are from one day to the next, usually, which is altogether too short a period to give results that mean anything. With the gluten, the percentage. of fat was four, and with the corn meal 3.9, practically the same kind of milk.

Prof. Whitcher was at that time studying the effects of food on the constitution of butter, whether soft or hard butter can be made by the use of oils in the food. In the next experiment he fed a daily ration of hay, silage, vetch, oats and middlings, first with no oil, then with the addition of palm oil, stearine, cotton seed oil, oleo oil or cocoanut oil, and then with no oil again. With the first cow the percentage of fat from the ration with no oil, was 4.43, with palm oil (which is the palm nut oil that has been talked about so much by German experimenters as one kind of fat from which you could feed fat into the milk) 4.52, stearine, 4.41, cotton seed oil, 4.11. That does not look very much as though the cow transferred that oil directly into the milk. The same thing is true in the other cases. When he fed varying kinds of oil he got practically the same amount of fat in the milk. I bring this experiment forward, with the one which I cited from German experimenters, to show that the feeding of fat to a cow in large quantities does not have a tendency to greatly vary the amount of fat in the milk.

PENNSYLVANIA.

TEST THROUGH 101 DAYS.

Effect of Quantity of Food.

EIGHT COWS.		Fat.
Coarse food ration quite uniform.	10.7 pounds grain	4.2
	13 pounds grain	4.5
	15 pounds grain	4.5
	12 pounds grain	4.6
	8.5 pounds grain	4.5

PENNSYLVANIA.

PERIOD 12 TO 22 DAYS.

Effect of Green Food.

SEVEN COWS.	Total solids.	Fat.
Dry food	12.75	4.15
Dry food plus 66 pounds green rye	13.01	4.32
Dry food plus 69 pounds green clover	13.01	4.32
Dry food plus 84 pounds green corn	12.71	4.54

Now I come to some of Dr. Armsby's work. I have passed by some experiments at Cornell, and Geneva, which are along the same line. They testify that no great variation is made by varying the food. This experiment in Pennsylvania was with eight cows during 101 days. The grain ration was gradually increased from 10.7 pounds to fifteen pounds, and then diminished to 8.5 pounds. I cannot give you the exact periods during which each of these quantities was fed, but it was fairly distributed through the 101 days, and very nearly the same amount of coarse fodder was fed throughout. The percentage of fat with 10.7 pounds grain, was 4.2, with thirteen pounds 4.5, with fifteen pounds 4.5, with twelve pounds 4.6, and with 8.5 pounds 4.5.

I have also an experiment in which dry food was fed against wet food, and I was unable to find any exceptions to this general result in all the work that has been done in all the experiment stations in the United States. I was unable to find that changing from corn fodder to silage, or from soiling crops to dry food, produced more watery milk, or less watery milk.

Gov. HOARD—Let me ask whether comparisons were between a given amount of green food and the same amount of green food dried, or whether the cow was given what green food she would consume and what dry food she would consume. For instance,suppose a cow takes eighty pounds of green, grazing grass, were these experiments made as to whether that same food, dried, was equivalent in dairy production or not? Did the cow eat an amount of dry food equivalent to the green food?

Ans. Not exactly in these cases. I cannot give you the exact figures, but the amount of dry food was greatly diminished. With the dry food the percentage of solids was 12.75 and of fat 4.15. With the green rye, solids 13.01, fat 4.32; with the green clover, which is a more nitrogenous food, furnishing very much more protein to the cow, solids 13.01, fat 4.32; with the green corn, solids 1271, fat 4.54. There is some variation, but I am unable to say that the green food was responsible for any better milk. Dr. Armsby states that the cow product did increase in quality during the experiment, but he was unable to trace any direct relation to the different kinds of food or to the green foods as compared to the dry.

VERMONT.

Effect of Quantity of Food.

THREE COWS.	Total solids.	Fat.
Six pounds of grain	12.56	3.96
Twelve pounds of grain	12.72	3.96

In Vermont, an experiment was made on the quantity of food, a repetition of two others, made in Illinois and Pennsylvania. With six pounds of grain food there were, in 100 pounds of milk 12.56 pounds solids and 3.96 pounds fat; and with twelve pounds of the grain food 12.72 pounds solids and 3.96 pounds fat.

WISCONSIN.

PERIODS 28 DAYS.

Oil Meal vs. Corn Meal.

FOUR COWS.	Total solids.	Fat.
Oil Meal (added)	14.69	4.99
Corn meal	14.92	5.08
Oil meal (added)	15.15	5.44

I thought I could not leave out Wisconsin under the circumstances, so I have one experiment from Wisconsin. In this state three experiments have been made in which the rations have been made more or less nitrogenous by putting in or taking out bran or oil meals. In no one could it be seen that the milk was modified by the food in any important way. The last experiment was with twelve cows, divided into three lots, and I have given the results on one lot where the food differed more radically than it did in any other case. With the oil meal added, the result was 14.69 per cent. solids, 4.99 per cent. fat. Corn meal alone, 14.92 per cent. solids, 5.08 fat. With oil meal again, 15.55 per cent. solids, 5.44 per cent. fat. As was stated in the discussion of the results, the milk increased in richness right along, though perhaps not quite uniformly. The corn meal did not have the effect of decreasing the quality. I believe the increase was accounted for by the advance of the period of lactation.

Now, friends, there is the testimony, and I am going to let you take it home with you so far as you can carry it in your heads. Sometime you will doubtless get a report of these figures and study them. If you conclude that you can take that thin-milk cow and make her give materially richer milk, why go ahead and do it, I should be delighted if you do. If you conclude that we must get an animal that is constitutionally capable of giving rich milk, and giving a good deal of milk, go ahead and do that, and my judgment is, friends, that this will be the wiser course, to hunt for a good machine as the basis of the work.

Now, I have kept you some time, but I have something more to say to you. I was advertised to speak this morning on "The Relation of Food to the Quality of Milk" but I shall introduce another subject without apology, but with this explanation. I am Director of the Maine Experiment Station, and that Station is located here to do a certain kind of work. It should, if it does its duty, stand as a kind of guide board in some things, to the agricultural public; not a guide board in all individual matters but along general lines. It is my ambition to make it such in a practical way. The people of this State, as well as of every other, have not quite forsaken the idea that they may find some wonderful means by which they can climb to success, instead of going up the rounds of the usual ladder. Men, the world over, have been hunting for the magical opportunity, and shrewd schemers have taken advantage of this fact and have pulled out of your pockets and mine, yes, out of mine once, a certain amount of cash without returning an equivalent. But the day has come, friends, when we must stop believing in magic, in the unusual, and bring ourselves down to the hard analysis of science, if we are able to use it, and of common sense, if we are not.

But what I am going to talk about this morning is condimental foods. I have no ill will towards anybody, I am simply doing what I believe to be my duty. A year ago we examined one of these foods and made some statements in regard to it, and so far as I am concerned I have no reason to recant, or take back any one of them. The strongest effort is being made, I find, to sell to the farmers of this State one condimental food at prices varying from $260 to $480 a ton. I want to talk about this a little while. Since I have been here a gentleman has come to me and asked, "Shall I buy fifty pounds of this for $7.00?" I have said, "Let it alone," and in repetition I now say that condimental foods are to be condemned. I am not condemning condiments, but they should be condemned as they are sold. Why? First, because of the absurd statements by which these foods are advertised. I hold in my hand a circular, and I find in it such statements as this, "The Most Wonderful Food Known!" The agent will say when you are talking with him in private that Nutriotone is not a food, and it is not advertised as such. It is. I can show you on the barns of this State this statement, "Nutriotone! The Most Wonderful Food Known!" Is not that plain English? The proprietors say it is not a food but they put into this circular, "The Greatest Flesh Former!" What is a flesh former but a food? They declare that it increases the quality of milk greatly. These experiment stations have been trying in all legitimate ways to increase the quality of milk, and they have not succeeded. But this stuff is advertised to do it! Draw your own conclusions. "Superior Quality of Beef in Three-Fourths the Usual Time!" "Swine Fattened in Two-Thirds the Usual Time!" This sounds like patent medicine claims. Here is a peculiar statement,—"To be given for Kidney, Liver, and Lung Difficulties," and in another place in the text it is declared that "Nutriotone" may be administered in almost any quantity. Do any of you know of the medicines that are given for such troubles, and do you believe they may be fed(!) in unlimited quantities? One of these statements is not true. Either Nutriotone is not a remedy for kidney and liver troubles, or else it should not be fed in unlimited quantities. Another thing, condimental foods have no recognized authority behind them. No station man who is known to be a man of any authority in this country, no veterinarian who is known to be a man of any authority in this country, is willing to endorse them, or can be induced to recommend them as foods. I am talking about them as foods. My friends, the food nutrients that are known to the world are known to men of science and to the medical fraternity; and no business concern in any city, eastern or western, knows of any nutrients that science and the medical fraternity do not know of. And that is true of medicines. There are no medicines known which the United States Dispensatory and the medical fraternity and the men of science do not know about.

There are no wonderful materials, which a business concern may collect from some mysterious source, that have other properties than the food which you handle every day, and you may obtain either from common foods or the drug store all the nutrients and curatives that are of value.

This question came up forty or fifty years ago in England, and Sir J. B. Laws took it up, and made some experiments. He fed two classes of animals—pigs and sheep—with condimental food. He found that the pigs consumed somewhat more food under the influence of condiments, but did not make any greater gain in proportion to the food fed. He fed twenty sheep with the condimental food for quite a long period, and found in several experiments that it actually took more food to produce a given gain when he fed the condimental food, than when he did not. There have not been many experiments since, as there is no reason for them. It is useless to waste time upon matters that we know enough about already. There have been some experiments made by Maine farmers, and one of them has told me what he did. He fed Nutriotone, and weighed and analyzed his product, and he got no effect. I give this as an item of testimony not found in this circular.

These foods should be condemned again because, if they have real medicinal power, they should not be fed to well animals. If they have medicinal power, they act upon the organs of the animal body. And do you wish to take yourself, or do you wish your family to take, something that acts vigorously upon the organs of the body all the time, simply that you may not some time be sick? What holds with regard to the human holds with regard to the brute.

They are to be condemned because they are not rational for even sick animals. Now do not misunderstand me. If you have an animal that is out of condition, there is a reason for it, and you should seek for that reason and treat the animal with reference to it, and not feed a gun shot dose of an unknown mixture.

Again, these foods should be condemned because of their cost. I have taken the trouble to go to quite a number of druggists, wholesale and otherwise, and get the prices. First of all I asked a graduate of the New York Veterinary College to give me a list of the possible things that could be used in a condimental food and be safe and possibly feasible, and he gave me the list. I have confidence in what specialists tell me, and I have the list here. Now all those things with the exception of iron sulphate,—the ground bone, pea and bean meal, ashes, charcoal, bismuth, subnitrate, salt peter, anise, coriander, and others, are the things that have been used from time immemorial. I have the authority of veterinarians, I have the authority of the medical books upon which our veterinarians rely, that out of that list there is no tonic equal to gentian, and I can buy that most effectual tonic at prices ranging from twelve to twenty cents a pound, in five to ten pound lots, or less than the retail price of nutriotone, which contains at best only a small proportion of condimental material. If condiments are desirable, and I do not deny it under certain circumstances, use them when you want them, and buy them as such, and mix them with the food yourself. Do not allow anybody who wants to make a dollar to convince you that you cannot buy them and mix them with the food. These condimental foods are costing as they are sold, in varying quantities, from thirteen to twenty cents a pound. In other words I can buy the pure drug, not mixed with linseed meal, or shorts, or gluten meal (and even the makers of those foods are willing to admit that they are largely made up of foods with which medicines are mixed), at the same price or even less than I can buy the condimental foods. One price has been given me on condimental foods of $480 a ton in fifty pound lots. I get all sorts of prices, but any of them are big enough.

Now, friends, perhaps I have said too much about this, but I believe it to be my duty to warn the farmers of the State against spending their money foolishly. If you do not take good care of your animals, if you do not use the effectual condiments which nature provides you in the shape of green foods, if you must let your animals run down, why then give them a little gentian mixed with the food as an aid to recovery. Fenugreek, which is largely used in the condimental foods, is not a curative agent; it is the least valuable of all the condiments. It is that which gives the odor to these foods. I wrote to Prof. Henry, whom we all recognize as a level headed man, and asked him if he had not written something on this subject which I could use, and he writes me this:—"I may have written something on condimental foods in the "Gazette" two or three years ago, I rather think I did, but it was not an article worth referring to in any way, and it would be of no use to you. Prof. Roberts in an early bulletin had something to say on that subject, and if you will hunt up that article you will be interested in reading it. I wish you would bring out something on that subject, for it is one that needs touching up. A great deal of money is lost in this country on condimental foods."

I wrote to Dr. Farrington, who is a graduate of our College and of the New York College of Veterinary Surgeons, and is now on the faculty of the Veterinary College at Washington, and he writes me this letter:—"Personally I think them (condimental foods) an abomination and a snare, and that they should be suppressed at all hazards, as they are merely ways to gull farmers who have little enough money at best, and who ought not to waste it in such worthless trash. Fenugreek, and that is one of the prominent constituents, is a mild drug with a high sounding name, but of no particular value as I can find out. (Dr. Salmon says he never heard of its doing any harm!) Its principal value comes from its being used from time immemorial, almost from the Greeks down. It is soothing, and in that respect resembles flax seed, marsh mallow, and slippery elm. It is classed with coriander, fennel, anise, etc. I should never think of prescribing it as a medicine if I were a practicing veterinarian. If tonic effects are desired, powdered gentian is what is prescribed for both man and beast." He goes on to speak of other condiments, and then says, "As agents to keep the bowels active, very small quantities of Glauber's salts, or Epsom salts, are beneficial; however, I consider turnips and beets more valuable. When used in this way, one ounce of salts and one teaspoonful of gentian may be used. After a time these tonics seem to lose their effects, so that it is not well to continue their use indefinitely."

What I have said I have tried to say for your good, and I thank you very sincerely for your kind attention.

One thing I omitted, we are to hold the usual dairy school this winter at the College, and we want some young men there. There are some young men in this hall who were there last year and who are better boys than before they went there, if it is possible. I have some circulars which I shall be glad to give to any who wish them.

Gov. HOARD—I have been very much interested and instructed this morning. I do not believe Prof. Jordan had a more thoroughly interested listener than myself in this audience. An old Dutchman out in Wisconsin says, "The longer I live the more I find, by thunderation, out." Now we have been led along the illumined pathway of careful, pains-taking, honest students; is it not time for us to begin to put ourselves into a frame of mind something like the character of the men who have so earnestly sought for the truth of things. That does not require any personality. Prof. Jordan is not at stake in this matter. You and I are at stake, and that is all there is to ti. And so, in the investigations that are incident to these mysteries, I ask everybody to put himself into a teachable frame of mind. Why, do you know the Christ himself has never been called a preacher, he has been called a great teacher. It is wonderfully easy to preach, but mighty hard to teach, to get at the reason of things. Consequently we need not only a teacher but we do need a teachable frame of mind. So many men wrap themselves in the mummy cloth of prejudice. I saw a mummy at one time, and I thought as they unrolled it and unrolled it, that they were simply unrolling the concentrated prejudices of all the ages. No matter how much I might have talked,I could have made no impressoin on that mummy. I could not have made the mummy believe that this was the 19th century,—not much. It was away back 3,000 years ago in Thebes. It is so with us often in our prejudices. I think the warping effect of prejudice may be illustrated somewhat by a little story. I was in Independence, Iowa, a cold, snapping day in 1868, twenty degrees below zero. In the hotel there was a coal stove, red hot, and in came a man with one short leg, all out of shape and distorted. He walked up to the stove and bent over it, trying to get a little heat.

Near by sat a man pretty drunk, and in his muddled, fuddled condition of mind he could not see what under the sun any man wanted to hump himself up in that way for,to get warm. So, in the kindness of his heart, he stepped up to the man that was bent over and said, "My friend, are you—are you a sound man?" The fellow canted back on to his short leg, and looked up at the man and said, "Yes, sir." "Are you—well as usual?" "Yes, sir." "Well, all I've got to say is that if you are sound and all right you had better get away from that stove for you are warping like the Dutch."

My friends, it took me a good many years to find out that my tendency to prejudice was warping me, and it took a good while to try, at least, to get out of it. I have not succeeded yet. The old time prejudices, the early impressions, stay by me yet. I want to say a few words along the line in which Prof. Jordan has been talking. I want to give you a suggestion concerning the changes in milk as the cow advances toward the stripper period. Let us remember one thing, which will help us wonderfully. The cow produces milk not for man, though man takes it and makes use of it. The cow's original design and purpose in the producing of that milk is not for man, it is for the calf. The whole philosophy and economy of the making of that milk is for the support of a little animal life. Now when the cow is first a mother and the calf is first a baby, the constituent arrangement of the solids in the milk is not the same as it is afterward. As the calf goes farther away from babyhood the character of the milk changes, until it is totally different from what it was in the beginning. Now shrewd men who are observing these things, notice that as the cow comes into the stripper stage the fine flavoring qualities in the milk, that produce fine butter, go out, and you have nothing but the simple fat, and you cannot produce fine butter with stripper cows' milk, so you must keep constantly putting in the milk of fresh cows. You know that the reason of this is that after the cow is from four to six months in gestation all the finer flavoring oils of this milk are drawn out of it, and go into the construction of the nervous system of the growing life that she is supporting. This is a question that I cannot treat as intimately and clearly as I would like, in a mixed audience. In my opinion there is nothing so vulgar as ignorance, but on account of people's prejudices I am constantly guarding against the statement of the truth as God made it; and yet that truth modifies your profits, and modifies your course of action.

One point more I wish to drop you a hint upon, and that is the construction of the udder. Prof. Jordan said a word to you this morning along the line of the breaking down of the fat cells, that marvellous transmutation more wonderful than the transmutation of metals, that takes place inside that dark spot; and I appeal to the judgment of men in this audience who have observed the structure of the udder in the cow as indicative of the quality of milk she gives, whether you cannot put your hands on the udder and almost tell whether the cow gives rich milk or poor milk. It is the general talk among farmers that they want a cow whose udder milks down, and becomes flabby and flat, like a glove. Invariably a cow with that structure of udder gives you poor milk. I will stake my reputation on it, for it is the result of a great deal of study, and I have a vast amount of matter upon these investigations of the points of cows. Almost invariably a cow's udder which milks down thin gives you thin milk, because if the cow puts a lot of fat into the milk there must be a lot of cellular machinery in the udder to do it, and when she is lacking in that cellular machinery, she simply gives you milk so much nearer water, although she may give you a large quantity. Therefore a cow that gives you milk rich in fat will have what is known as a meaty udder, with a large amount of cellular machinery in it by which the fat is evolved. You get something of an idea of the manner in which the physiological machinery does its work. Trace it back and you will see that little drop of fat being organized out of the tissue. Another thing which was evident from the experiments given was that the man had fed the cow and stored her full of tissue, so that when the change was made from fine to poorer food, having learned the ways of righteousness she continued therein. It is the funniest thing that a man will feed a hog to the verge of inertia, and starve a cow half to death. I do not know what is the matter that men are so afraid of putting feed into a good cow. I think the difficulty is they are not so certain that the cow is a good one. The education of the talk this forenoon was that we should go back to first principles and study the important point of the construction of the cow. The breeder is God's vicegerent here on earth whom God has given the right to fashion life. And when these wonderful students, walking hesitatingly and tentatively along this mysterious pathway have finally fashioned the beautiful Jersey or the Holstein, or produced the lordly Shorthorn, why should not we, the farmers of the land, take advantage of these things more largely and intelligently than we do? I say to you, friends, that the first thing to learn as a dairyman is how to breed a good cow. Those feeding experiments show this. There are no short cuts to Heaven, and there are no very short cuts in the making of a good cow.

These hints in regard to the construction of the udder I want you to take home with you. Take a Babcock test, analyze the milk, and feel of the udder after the milk has been drawn from it. And when you go out to buy a cow take a little comparative judgment along with you. I remain, yours sincerely.

WASTE AND ECONOMY IN DAIRY MANAGEMENT.

By Ex-Gov. Hoard of Wisconsin.

Mr. Chairman, Ladies and Gentlemen: I wish to preface the little which I shall say, by a few remarks of a more general character. The great business of dairying throughout the United States and Canada is attracting, more than any other branch of agriculture, the hardest thinking, the most exhaustive experimentation and the largest attention of the thoughtful element among our farmers. Farmers differ, the same as blacksmiths differ, the same as shoe-makers differ, and the same as all other classes differ, even lawyers and statesmen. We have a low grade of farmers and we have a high grade; we have a low grade of lawyers and statesmen and we have a high grade; there are titmans in all flocks. I have got through trying to convert the whole bunch at once to my way of thinking. If I can, here and there, get a man to follow in these lines it is all I can hope to do. And I want to say one thing more;—it is a prevalent notion, both in Wisconsin and in Maine, that dairy thinking, dairy practice and dairy study are altogether different in one section of the country from what they are in another. A greater fallacy never existed among farmers. The cow, and the principles that should govern us in breeding the dairy cow, are the same whether in Maine or Wisconsin; the construction of the stable and the management of that animal are the same whether in Maine or Wisconsin; we have practically the same climate that you have in winter, with more difference, it may be, in summer; the study of the art, or science, of feeding is the same in Wisconsin as it is in Maine. The only particular difference that I can see between dairy practice in Maine and Wisconsin is in the character of our soils, and the consequent necessity of a difference in farm management,—soil management, soil cultivation. But in the main the crops that we grow for the sustenance of our dairy herds are just the same in one place as in the other, and therefore a well schooled, intelligent, thinking man can go from Maine to Wisconsin and instruct our people, because he studies along lines identical with us. There is scarcely any other branch of farming in which there is such an agreement of both mentality and condition as in that of dairying. Now when we come together and thoughtfully confront these questions let us for the time being forget the state we are from, or rather the state we are in. A college bred minister from Massachusetts (I think it was) in the early settlement of Wisconsin came out there to preach the Gospel, and commenced his first sermon by saying,—"My friends, I think it is proper to say that I am just from college, and if I should chance to use language and embark upon a line of thought somewhat different from your own I trust you will bear with me, because the scholastic air of my environment may have been somewhat different from yours." An old fellow who sat on the front bench stretched up his arms and yawned and said,—"Oh, well! well! drive ahead, we are all from somewhere." The one great condition that brought them together as hungry souls was lost sight of, don't you see, in the other proposition of where they came from.

Now I want, if possible, that we should spend an hour here in quiet, steady and studious contemplation of some of the difficulties that confront us in dairy practice. For a great many years I have been fighting this great demon of waste. I early saw that the difference in reward that came to my neighbors and to myself was not so much a difference in what we earned as in how we earned it, and also in the economy of our method. Since the establishment of our creameries I have been confronted with that fact more than ever before. I may say, as I said to some of you when I met you at Foxcroft, that I am in close and steady touch every day in the year with about 800 farmers. Those 800 farmers bring to the Hoard Creameries every morning their milk, and in the aggregate at the end of the year there has been paid to them about $340,000 for that milk. The proportion of that money which is profit to those men varies so much that it startles me. There are men in that combine with ten cows who make a larger net profit every year with clean money to lay in the pocket, than other men do with twenty cows; and that fact has caused me to look deeply and narrowly into the situation. What is the matter with the twenty cow man? What is the matter with the men that are so constantly hard at work,—yes, working harder than the others,—that they do not receive larger profits? I find when I come to study them that they are constantly groaning and constantly complaining in regard to the price of their product. Their minds are all the time upon the amount of price per pound, which they are to receive for their butter. I find that the men who get the largest profit take up this proposition,—they say the price of our butter is something we cannot control. It is the farther end of the string which is beyond our reach. We are unable to make much difference with that, except so far as we shape the character of the product. We cannot control the price, the market end of the string. What is there in the whole string that we can control? Why it is the end that lies with us, the manufacturing end; we can control that. But there are so many farmers who are looking away from this end, letting this end lie loose and neglected! Their whole vision is fixed upon the farther end where they can modify the conditions scarcely at all, when here lies a domain in reducing the cost of production which would put enhanced profit into the hands of every man. That will be the principal portion of the theme of our talk to-day.

The great painter Raphael was once asked to embody in a single sentence his definition of art, and it is said that he thought for weeks and weeks upon it and finally submitted this answer,—"The ability to see." I wish every young man would for a minute listen to this definition, "The ability to see." Unless the eye can see the picture clearly, the hand will never paint it. Now what does that mean? It means that intellectual perception must precede the work of the hand. No doubt God makes a great difference in the intellectual stature of different men, and as much difference in farmers as he does in statesmen. The only difficulty is that in the process of natural selection the statesmen get culled down and the farmers unfortunately are not culled. The farmer says, "I have a right to exist; my existence does not depend upon the favor of my fellows," and as a consequence that process of selection which we use with our cattle we do not use with our farmers. I believe I said to you once before, and I repeat it, that if a cow could talk she would be heard all over the land crying in the loudest terms possible for an improved breed of dairymen. The cow end of the question to-day is not so much in need of breeding, weeding, selecting and cultivating as is the man end of the proposition; and therefore I am constantly working to get this matter before the people so that they can see the principles involved.

Now starting with this idea that what we want is "The ability to see" let me say first that it ought to be the religious duty of every farmer (and I put it on the ground of religion because I have the example of Moses. When he promulgated certain sanitary regulations for the Children of Israel he put a "Thus saith the Lord" behind every one of them) to put himself into the condition to see dairy truth, and not shut his mind away from it; not thinking that if he saves a little money now and then in expenditure for the enlargement of his mental vision he is making money thereby. That is not true. The amount spent by the dairy farmers of Maine, who keep cows for profit, on their intelligence is pitiably small, so small that it is ridiculous to state. It does not amount to fifty cents a year on the average in the United States. Now is that right? Are men doing for themselves what is for their best advantage or are they standing in their own light? Therefore I take up the question as the first proposition in this case, what is economy for the dairy farmer? What shall he do? I would say that the first thing he should do is to put himself into the current of dairy thinking and dairy knowledge. Do not stand on the bank and see the river go by and say that it is not for you, but get into the current. Every opportunity that you have of attending a convention, securing dairy literature or talking up dairy study, be sure that you improve. Let it be considered a matter of just as much moment to secure such a thing as it is to purchase cotton cloth for the family. When Mr. Gurler published that book of his on "American Dairying" he put into it the results obtained by a studious life with a herd of fifty cows. How has it been received by the men who most tremendously need fertilization of thought in that direction? Why the man has sold in the neighborhood of ten or twenty thousand copies, it may be, when there are three hundred thousand farmers in the state of New York keeping cows for profit.

Now, my friends, I say to you that this sluggishness and indifference which characterizes us as a class is standing between us and success. Therefore it is not good economy,—it is a matter of waste, constant waste; wasted time and effort, because the dairy farmer does not educate himself more thoroughly in the principles and practices of modern dairying.

Now we have to-day certain necessities which confront us. First, is the necessity of more revenue. You know, I know, and every other man knows, that the expenses of our modern civilization are decidedly greater than those which confronted our fathers. You know that it is impossible for a man to-day to sustain himself and his family and educate them and himself to an intelligent citizenship upon the same revenue that characterized the farmers of fifty or sixty years ago. From 1855 to 1857 I was a cheese-maker, managing a herd of 45 cows, handling the milk and making that milk into cheese. The farmer who owned the herd was making money, getting rich as the word went then, with cheese at six cents a pound. Men thought then that five and six cents a pound was a good market price for cheese, seven was an excellent price and eight was wealth at once. To-day the farmer that does not secure from seven to ten cents a pound does not feel adequately rewarded for his labor and capital. This shows us that civilization to-day in the same grade of American society is fifty per cent. more expensive than it was in 1855. We must have more revenue,therefore we must institute better economies in the conduct of our farms, and in particular in the management of our dairy. We must remember that we are not making butter or cheese and handling cows according to the notions of thirty years ago. The market demand has changed entirely. Why, the taste that governs the market in butter is not at all like that which governed it thirty years ago. To-day the demand is for a quick, lively, deliacte, fresh-flavored butter. Thirty-five years ago the demand was for something else entirely. People sought everywhere for fine June butter put down in the farmer's cellar and kept for January. Fine, well packed June butter, was the butter that was considered the best article, and commanded the best price in the cities thirty-five to forty years ago. I know that in many of the Eastern states, in portions of New York, Connecticut, Massachusetts and Vermont (I do not know how it is in Maine) men are busy to-day on their farms doing that same thing,forgetting that the times have gone past them. Only two or three years ago Mr. Chas. R. Beach, one of the ex-presidents of the Wisconsin Society, went into Chemung county, New York, to visit some old friends there and told me he never was so amazed in his life as when he stepped into a man's house and found that he had the whole of three years' make of butter in his cellar, holding it for an increased price. He said to him, "Heaven bless your innocent heart, don't you know that the day for that thing has gone by?" I, myself, in 1884 went to a farm in Jefferson county, New York, where two young men, who had followed in the footsteps of their father, had 45 cows and were churning in a dash churn, raising the cream by setting the milk in open pans and were keeping their butter. They had in their cellar all the butter they had made from May, and this was November. I sat down and said, "Now, boys, let us put a little pencil work to this." I had in my pocket a little book which gave me the average for each month of the market for New York city. I said, "If you had sold your May butter when fresh you would have got so much, June butter so much, July butter so much, and so on for all the months to November. What can you get for this butter to-day, just as it stands in your cellar?" They said "seventeen cents." And then I figured up what it would have amounted to if they had made quick, fresh flavored butter and put it upon the market, no matter what the state of the market was. I found that it amounted to a difference of $380 that those young men had lost by adhering to notions that did not fit. A man may bring me the best shirt in the world, made in the most fashionable manner and with the most costly material, and if it is made for a number one man and I am a number ten man, it will not fit. And just so in the matter of dairying. We need, in the light of to-day, to consider the application of economies to the present situation of things. The moment you get a farmer to post himself up in what is meant by modern dairying, with all its economical appliances, with all its advantages (not saying that everything he has proposed to him is an advantage but posting himself as to what the advantages are) that moment you begin to mend the waste places. By an inevitable law, he sees, himself, where the waste comes in. Therefore, I say the first thing to do is to get the mind of the man into a receptive mood, that he may be teachable.

Second, one great waste is in the farmer's idea of what constitutes a dairy cow, and how to construct her. Now, I rather think that in many particulars the farmers of Maine need this injunction less than those of almost any other state; but I have had a great deal of controversy, by letter and in person, with different men in Maine and have made up my mind that there still remains among the dairy farmers of this State a great deal of the old notion concerning what is called the general purpose cow. That may be all well enough if a man can stand it. I am not here to interfere with any man who is able to pay for any luxury that he wants. I would simply say to a man who would bet his money on a heavy draft horse if he were putting him into a trotting race, "If you desire to fry in your own fat I am certain it is not my fat," and I should not exercise myself too much about it. I might say to him as the Irishman said to the bull when the bull charged on a locomotive. Pat says, "Begorra, I admire your pluck, but damn your judgment."

Now, then, modern dairying demands the construction of the modern dairy cow, that is, the special purpose dairy cow. In the nature of things, good friends, you and I cannot afford to put good costly feed into a cow for twenty-five cent butter, and then find ourselves obliged to take up with three cent beef: because the same food that will make a pound of dressed beef will make a pound of butter. It has been demonstrated by experiment that the food which, fed to a well bred special purpose dairy cow, will make a pound of butter,if fed to beef cattle will make a pound of dressed beef. This shows us that this machine that Prof. Jordan was talking about this morning takes this feed and sends it down one track or the other, just as we have constructed her in our intelligence or ignorance, and it is very important to us that we turn the switch right. For unless we are careful the feed that we design for profitable butter will go down the track that is to bring us unprofitable beef. Now what can we do? We can do much,—not all we want to do,—but we can do a large amount by the exercise of intelligence. Let us look at the matter of the form of the dairy cow. The dairy cow agrees in all particulars almost universally as to the character of her make-up, her shape, her form, her type. I spoke to you in 1890, I think, at Winthrop, upon the dairy temperament in cattle. I spoke to you on the principle of form or type in dairy cattle, and what it indicated. I had been a student of that subject for many years but had never dared to open my mouth for fear I was wrong. But I kept fortifying my position until it seemed to me that the logic of the facts bid me proclaim it. I presume many of you remember that talk and remember how I dwelt earnestly upon the value of type and form to enable the cow to do her work rightly. To-day I find many farmers everywhere who have the idea that this is bookish, and theory, and not essential. And yet that same farmer if he lives in Maine would no more think of breeding a trotting horse with a draft horse form than he would think of cutting his throat. Why should not the application be the same as regards the function of the cow? You all know that the form of the dog depends upon his function. The grey hound has a speed form, the bull dog a blocky, fighting form, and so on, function determining form,temperament determining function.

Now, then, the wise farmer says, "I will be obedient to that law, I will not fight it," and he takes advantage of it. I want to give you a little illustration of the practical outcome of just that work. Prof. Hacker of the Minnesota Dairy Experiment Station,who had been with me in this study for a good many years and was my executive clerk while I was in executive office in Wisconsin, is a breeder of Jersey cattle,and for ten or twelve years we have compared notes. When he became a professor at the Minnesota Station he said "I will demonstrate these things for good" and he carried on a process of experimentation there for one year with a herd of cows, keeping a most delicate and accurate account of their performance as it related to their form and function. There were five illustrations of the different styles of cows given, from the beefy Shorthorn Dido, who produced only twenty pounds and fourteen ounces of butter to every hundred pounds of her live weight at a cost of 12.2 cents a pound for the butter, to the Jersey cow Dora, who produced 48.91 pounds of butter to every hundred pounds live weight at a cost of 8.8 cents per pound. Dido weighed 1255 pounds and produced in a year 262 pounds of butter, or, as I said, twenty pounds and fourteen ounces to each 100 pounds of live weight. Now what must be the cost per pound of the thousands of cows that do not produce over 150 pounds of butter a year? Good friends, the cows in Maine, as near as I can get at it, and you average as well as any state in the country, do not produce on an average more than 150 pounds of butter a year per cow. Now that is a constant decrease of profit and an enormous waste. It takes 150 pounds of butter sold at the highest market price in Maine to pay the expense of keeping a cow one year, and it is impossible to get by that fact. Now if that is the average for Maine, just think of it! What a reduction it must be to the whole revenue of this State and consequently to the general prosperity of this State. The cost of keeping these unprofitable cows remains the same; the revenue therefore is to be changed by the application of this switch power called intelligence. Both of these cows used in the illustration are excellent specimens of their breed as dairy cows. The cow Dido as a Shorthorn is an excellent specimen of her breed as a dairy cow; Dora is an excellent specimen of the Jersey. Figure the profit of Dora as a dairy cow above that of Dido. Dora produced 166.61 pounds of butter more than Dido, and did it at a less cost per pound of 3.4 cents. In other words, she produced the 262.30 pounds of butter that Dido produced, at a saving of $8.91 in cost of feed, and produced 166.61 more. Now that is what is playing the mischief with your investment so many times,—the keeping of an unprofitable cow and being content to keep her because you do not know better. Dido consumed in feed $32.13; Dora consumed $37.58, or $5.45 more. But here is where the special results of her special purpose breeding came in. She turns her food into butter and not into the support of the 365 pounds of extra flesh that Dido carried. Men have argued themselves into the poor house, almost, in trying to deny the truth of the special purpose doctrine. They would say, "It costs no more to keep a big beefy cow than a small one, and when you are through with her she will sell well for beef" and a lot more of such talk that does not apply to straightforward dairy farming. We hope that dairy farmers will soon begin to learn for their own benefit certain cardinal dairy doctrines; viz,—

1st, If we are seeking for the highest production at the least cost we must select the special purpose dairy cow, one that has been bred for the work.

2nd, There is such a thing as a dairy form, shape and make-up, internal as well as external, that a cow will have, and this form is indicative of whether she will turn her food towards butter or towards beef. If we are after butter, we want butter to the highest economic ability of the cow, and we do not want beef.

3rd, The special purpose dairy cow calls for special purpose understanding on the part of the man who is to feed and handle her if she is expected to return her best profit.

4th, Dairy cows require dairy housing, dairy care, and dairy feed. They are subject to special dangers and disasters, because they are highly organized dairy cows. Therefore it pays to do business with the dairy bred cow providing we rise to the occasion and become dairymen who know good from evil. These were the comments I made in "Hoard's Dairyman" upon the experiment when it was made and I bring them in here to illustrate in a practical way the difference of reward that the one cow would have given her owner in place of the other. Not that every man is going to secure a Dora right away. Not that the average cows of Maine are equal even to Dido. But this shows us the road, and yonder is the mine. Now the most of us, because we canot jump from where we are to the mine at once will not proceed to travel the road at all; but yonder is the gold we seek, and there is the road we must walk in order to reach it. Therefore it is not good economy, friends, for us to entertain wrong notions about the dairy cow.

Another greatly mistaken notion which we have is in the construction of our cow barns. We are being alarmed all over this country at the spread of disease among dairy cows. Last summer I travelled across the State of Maine and kept my eyes out every step of the way. And going from Nova Scotia with Prof. Robertson I said, "Now you look out of one side and I will look out of the other, and let us see just exactly how many men in Maine have a modern dairy barn." Not that we were going to see all the barns in Maine, but I meant the number that we could find in going through. And do you know, my friends, I do not remember just the number, but I figured up that seventy-five per cent. of the barns that we saw from Bangor to Portland were built on the basis of forty or fifty years ago. Even new barns were built with underground stables, in much the same fashion that their grandfathers had built them forty or fifty years ago. Their grandfathers were not confronted with the diseases, nor the danger of disease, that we are confronted with to-day. In going along we would see those barns with a window once in ten or fifteen feet. I will guarantee that if you stepped inside of them you would find that a man cannot read his title clear, in print of large type even, when the doors are shut. Now sunlight is one of the most powerful disinfectants that we have. Sunlight is the most important thing in dairy farming. These dark, damp barns have simply been pest houses for the breeding of weakened and enervated animals. We have reduced the resisting power of the cow so that when infection of any kind is admitted, that very moment our cows are at the mercy of that infection. Tuberculosis is an infectious disease. Pleuro-pnuemonia is an infectious disease. They do not travel in the air but travel by contact. Now when we shut up our barns and make them tight and force out the sunlight, keeping those cows crowded, and are all the time talking about the economy of room and not about the economy of cow, we are simply putting a premium upon our own loss, and it is not good economy.

Now the modern dairy cow has been constructed in conformity with the modern condition of things,and she should have the environment that belongs to the modern dairy cow. She should not be obliged to live in a stable where there is not at least from 800 to 1000 cubic feet of air for each animal, and it is cruelty, it is suicide, to do these things. A good old friend of mine in Wisconsin who had a very fine herd of cows was lately visited by the health officer, and the first thing he knew thirty-eight out of his herd of forty cows were ordered killed. The old man cried like a baby, and I felt a deep sympathy for him. He said, "When I saw those beautiful animals go out one after the other I was almost ready to say, take me and leave the cows." What was the matter with my old friend? He had been too economic of room and had crowded those cows, and the first thing he knew he bought a cow that had tuberculosis. He did not see the progress of the disease and did not know it, but he found after a little that he had two or three ailing animals, and the disease seemed to spread until thirty-eight out of the forty were ordered killed. Was it good economy? No! We have been too stingy of room and too stingy of the expense necessary for room, and too prodigal of life and health.

Another thing,—in the construction of these barns we ought certainly to provide for their ventilation. Do we do it? No! I will guarantee that nine out of ten of the men that go home from this dairy meeting will look at their barns and say, "I guess we had better get along just as we have. That fellow up there has been shouting away, but I guess our cows look as though they could stand it and if they can stand it I guess we can." I am reminded of a story of Abraham Lincoln. In 1864 you remember the Wade Manifesto came out and Freemont was nominated. We thought that Abraham Lincoln was likely to be defeated and those of us who had our hearts set on the contest were full of fear: Lincoln was waited on by the men who sympathized with him and they told him they felt very sorry to think that the friends of the Union should divide themselves at this very hour of danger. The old man looked good-natured and kindly and said, "Do you know, it makes me think of an old friend of mine down in Sangamon county, Ill. He sent his boy off to school and the boy got a smattering of science and came home and sat down to dinner one day, and the old man picked up a piece of cheese. The boy says, 'Father, don't eat that, it is full of living animalculae.' 'Full of what, Tom?' 'Full of living animalculae, father.' 'Is that so!' And the old man took another bite and says, 'All right, Tom, I can stand it if they can.'"

Ques. Has not tuberculosis been found in barns that have been built on modern principles, and where the cows have had the best care more than in any other place?

Ans. I find that the investigations of tuberculosis have been carried on by men advanced in their thinking on that question and the disease has been discovered in many instances in good barns; but I know of many instances where tuberculosis has been clearly traced to close barns, filth and unsanitary conditions, and I believe that what I am talking upon, as a general principle, is correct. You may cite me a case where a man in a fine, healthy home has the small pox. I believe that he will stand the small pox all the better on account of that surrounding, if he has it. But when you tell me that small pox is incident to, and originated because of, good surroundings, I would hardly call that good logic.

I will say this,—that tuberculosis as a disease of infection thrives best in large aggregations. For instance, if you have a large herd of cows, in proportion as you increase the herd you increase the ratio of danger. Now if you do not carefully tend your herd and provide for them pure air, you thereby again increase the ratio of danger. If you do not disinfect those stables thoroughly and keep them clean, you add still more to the ratio of danger. If you deny them sunlight, you add still more to it. I have noticed that those herds that have a large amount of sunlight provided for them, and where land plaster is used quite thoroughly, have been shown to be remarkably free from infection, unless it could be traced directly to some importation of an infected animal. A man in my own state has lost his whole herd of cows from buying an infected sire. He put him into his stables and he died of tuberculosis. The man did not know what the disease was, and said nothing to anybody concerning it, as he thought it was smart to keep it to himself. He bought another sire and put him in the same stable, and that sire died. Presently he put one of his cows in this stable, which was set apart. She took the disease, and was taken back again and the whole herd was swept away with tuberculosis. You see that the tuberculosis in this case was clearly traced to infection. Then how would you minimize infection? By surrounding the animal with as cleanly conditions as possible and with plenty of sunlight. I am called a crank on land plaster. It is composed of forty per cent. sulphuric acid, and may this not be a hint as to why it is so useful as a disinfectant. It should be used in every dairy stable in the land. It will pay largely for its cost in the manurial benefit that you receive.

In regard to the waste because of a low grade of cows, let me illustrate. Just before I left home I received a letter from Mr. Sneath of San Francisco, Cal., who has an average herd of 500 cows. Those of you who read "Hoard's Dairyman" will see in this last number his article. He and I do not wholly agree upon some things, but it is a valuable article and I publish it gladly. He has an average herd of 500 cows that he milks for the San Franciso market. He says, "We raise annually 125 calves—we cannot raise more than that—but that is not enough to keep up the ranks. In our herd my standard is 5,000 pounds of milk a year, or in eight months, or between calves. Every cow that does not come up to 3000 pounds I reject unless she be a heifer with her first calf. Now in order to keep up this standard I have to step out and buy largely of the very best cows I can get, and I find that I have to discard seventy-five per cent of those cows to get cows that will come up to this standard."

Think of it! Think of the enormous waste that is going on in this country constantly by the lack of intelligent ideas in breeding cattle. Seventy-five per cent. of the cows that that man buys, paying from $40 to $60 a head, he must discard because they will not produce him a profitable return. A neighbor of mine informed me that he undertook to buy a herd of cows that would produce him 200 pounds of butter a year, that is 5,000 pounds of milk at four per cent; and he told me that he had purchased over 100 cows before he could secure a herd of twenty-five that would produce 200 pounds of butter a year. This enormous waste that is going on among our farmers by virtue of having these unprofitable cows is one of the most amazing things, in the light of this day and generation. It is because the farmer is unwilling to put himself into a condition whereby he can correct this waste. How shall he do it? Every man ought to purchase a Babcock test. It is ridiculous for a man to stand and balance $5.00 against the information that it might bring him. Then he ought to test every cow. It is a simple proposition. It does not cost me ten dollars a year for a man's time to test and weigh the milk of every cow. A little piece of paper is tacked up behind each cow, and with a spring balance he weighs the milk of each cow and takes a little sample each day. Once in three days it is tested. Every day I can know just what that cow is and what she will do, and know what her feed costs me; then I can tell very quickly what my profit is. And there is not an intelligent merchant in the land who does not put this process at work. Why should not the farmer institute these methods? And when I plead for this, good friends, I plead for the money that is to go into your pockets, I am not pleading for myself.

The first thing to do, then, is to clean out this unprofitable mass of cows. One man said to me, a poor old German, "How my farm would look if I did not have more than half that number of cows!" And there he was keeping about twenty-five cows because the farm would not look well if he had only ten. I said, "I will guarantee not twelve of the cows are paying you a profit." "Vell, I kind o' like dem cows; I stay by dem." I have to be patient and good natured with all these things, you know, but I get earnest, for I see so much of it, and see men longing so for better returns and still clinging to error.

Now I come to the part of my subject along the line of farm management, the production of food. My friends, it is the strangest thing to me,—the slowness with which these ideas make way. Take, for instance, the silo. Among the 800 patrons of the Hoard creameries there are about 250 silos. There have been more silos built in the past year, or two years, than there were in the whole previous history of those 800 men. Men have been very slow to accept the silo. These summer droughts are making us tired, and all over the land it is becoming a serious question whether pasturage in many particulars is not too costly. It is too costly when we consider the small amount of return we are getting. I know of patrons to-day that have scarcely dropped a particle in their milk through the severe drought of this present summer. You will consider that we had only five inches of rain fall in four months, when last year we had fifteen and one-half inches, and that the drought was the most severe ever known in the West. You can see to what a trial we were subjected for the support of those cows. Yet there are two men, and only two, who had the enterprise and intelligence to put in a summer silo. A year ago last fall those two men filled silos for summer use, and when this severe drought came and the pasturage began to grow brown and dry and the cows began to shrink, the silo was uncapped and they were fed with this succulent food and they held steadily along. When the fall rains came and milk began to pay better those cows were doing good business, while the other men's cows were simply giving driblets. This is the economy of the more modern and intelligent man. The silo to-day I believe is one of the grandest blessings that has ever come to American dairymen, and I know by practical experience that the men who have silos are the most successful. The result of their labors passes before me every week, and I study them as I study nothing else under the sun; and I know that those men have a bank account that justifies my utterance here. I know how much better those men do their work and how much larger their profits are. And yet there are lots of men who will stand and haggle and quibble and say, "Don't you think it is too expensive," when they are losing every year, in milk, enough to build the silo. Well, I cannot convert the world, I told you so at the outset. An old fellow drove a bull to market and did not sell him but drove him back, seven miles. Some one said to him, "Don't you think that was a pretty hard job?" "Yes, but I got a splendid drive out of that bull." I have what comfort I can on the road.

Now in regard to the construction of the summer silo I want to say just a word, in case there is anybody here who might be tempted to do something for himself more largely in this line. We have got to come to it in the West. One of the most intelligent men in the handling of his cows in the whole West is Mr. Gurler, who wrote this book on "American Dairying." There you will find an illustration of the winter and the summer silo. We must build the summer silo different from the winter one. We must make it smaller and deeper. Smaller for the reason that when we uncover it at the top we are uncovering it in warm weather, and as a consequence the heat of the atmosphere would naturally cause it to ferment and sour next to the air; therefore we need to have it small enough so that the daily demand of our herd, whatever its size may be, shall enable us to take it down at least from two to four or six inches. In the winter time when we uncover the silo we uncover it in the refrigerative effect of cold weather and it keeps easily. You see the difference in the management of the winter and the summer silo. For your own sake I want the people of Maine to give this a little more thought along that line of economy.

Ques. Wouldn't it be better to make the silo smaller at the bottom than it is at the top on account of its settling and sinking about the edges?

Ans. No, sir. It is not better, because if you do that it brings too great a strain on the edges; and again, you can provide for that matter of settling very easily by keeping the edges of your ensilage about two feet higher all around as you are filling the silo. Let it be lowest in the centre and highest at the edges.

Ques. What would you fill your summer silo with?

Ans. Corn. At the time you are filling the winter silo fill the summer silo. In all these things the main thing to deal with is to be certain of the soundness of the principle. It is not certain that every man here can have a slio, but it is certain that every man here ought to be as easily conceived as any other man, of the necessity of one, and then work to it just as soon as possible.

Now a third economy in dairying. I am coming to the point, my friends,where I maybe misunderstood. I have had a great many men say to me that I was not an advocate of private dairying. Heaven bless their innocent hearts, I am an advocate of any kind of dairying that pays. The great point with me is to get returns. The man that is a patron of a creamery is engaged in private dairying up to the point of simply the last work, the matter of making the butter, and that man has to meet all the problems that are connected with dairying except that one question of the manufacture and sale of the product. And in these days we should be students of the market. The market to-day is constantly calling more and more for the perfected article which is made by co-operative work. And the co-operative work is so much easier! Just think of it as a matter of economy. These 800 patrons that I speak of are no different from 800 men in Maine. These 800 men would make 800 different kinds of butter under the private dairy system. To-day they make one kind of butter. And there is the very highest breeding skill in the combine. There is General Burchard, with his herd of thoroughbred cows. We pay him the highest amount per cow of any man in the whole combine, and return him his skimmed milk. He had a herd of 19 cows, nine of which were two-year-old heifers. Strange as it may appear, that man made that herd of thoroughbred Jersey cows produce more pounds of milk, per cow, than any other man of the 103 patrons in the home creamery. And there were in the combine thoroughbred herds of Guernseys and Holsteins. Gen. Burchard handled that herd from the construction of the cow down to the landing of the milk in the creamery by the light of modern intelligence in dairying. Now his pay came, didn't it? We paid him $1.36 a hundred for milk, while other men were paid eighty-nine cents. These things are convincing. A neighbor of Gen. Burchard's who does not believe in the silo and is fighting it all the time is a patron also. That man made a profit of $3.07 per cow last year, while Gen. Burchard's profit was in the neighborhood of $35 per cow. And yet that fact could not convince the $3.00 man. I believe in a man's being honest, and I have a doubt sometimes, if half our men are honest with their cows.

An Irishman came along in a grave yard and read this epitaph, "Here lies John Thompson, a lawyer and an honest man." After studying it, "Well! well!" he said, "Begorra, there must be two fellers in that hole." Now Gen. Burchard is a lawyer, my associate editor, a brainy lawyer and a brainy farmer; a man who was trained and reared as a lawyer, but one of the most instinctively and rigorously honest men that I ever knew in my life; so that he cannot and will not allow himself to do a dishonest thing to a cow. I prefer this epitaph that was written by John Konkerpod, a Stockbridge Indian, a poor drunkard, a graduate of Yale or partial graduate.

"Here lies poor Johnny Konkerpod; have mercy on him gracious God! He would on you if he was God, and you was Johnny Konkerpod."

Now I have always believed that old Johnny Konkerpod would have made a first class dairyman because he had a strong sense of justice in his heart. He was citing the golden rule, even to his Maker. That idea of being thoroughly honest with a cow is a matter of the highest degree of economy.

As regards the question of economy in co-operative work, my friends, there is a chance for us to get rid of certain notions. The growing tendency of the time is towards co-operation, and I believe that it is one of the most important things for us to study. What can we do by co-operation? If we co-operate as patrons of a creamery we can buy our feed together. Let me say to you that one of the most important things that is done in our creameries is the buying of feeds at wholesale. I saw the time one year, when there were 400 carloads of bran unloaded at three railroad stations near Fort Atkinson in Wisconsin. I see now that by the use of this co-operation, these intelligent farmers coming together and agreeing, they can purchase their grain by the carload and in this way secure the advantages of the market. It is an old grange idea, but it can be put in practice to a wonderful extent. Also, the farmers secure in many particulars great assistance by co-operating in the purchase of their implements.

The final question of economy is the economy of dairy farming over any other kind of farming, and I want to speak to you just a moment on that line. There is no other kind of farming in which intelligence and skill play so important a part. Take, for instance, grain growing. Your neighbor right here is a very intelligent man, but his bushel of wheat and his bushel of barley are worth no more in the market than your bushel of wheat and bushel of barley. There is in almost every kind of farming except in dairying a wonderful scaling or grading down to an evenness with everybody, and no chance for the benefit of possessing skill. But the moment you step into dairy farming that very moment skill and intelligence increase the profit. If a man wants to be skillful and intelligent, the butter, or cheese, or milk, answers to this sanctification of skill. One of the important things of the present day in the market is that the market refuses to take the crude, unskillful product of the farm and pay for it. I hear farmers complain that they work hard, and Heaven knows they do, but they cannot get pay for their hard work. They have made this mistake,—the market is not paying for hard work, it is paying for skill. The market does not care whether that pound of butter cost you one day's work, or a week's work, or a month's work, or a minute's work. The question is;—Is the pound of butter what the market wants? Now let us be intelligent and adapt ourselves to the changed conditions of modern dairying. Let us be thankful also that dairying gives us an opportunity for this higher, wider, freer, better exercise of intelligence and skill; and in particular that we can receive a larger reward for our labor.

My friends, I have gone hastily and cursorily over some of these questions of economy, and striven to get general principles into your minds more than particular, specific statements. I am satisfied with the intelligence of Maine as I am with that of Wisconsin. Just the minute the general principle takes hold and is understood it has free course and is glorified.

Ques. What effect is oleomargarine having upon the dairy business of our State? Also what is the duty of the dairymen of this State to help suppress it?

Ans. That is another question of economy. The National Dairy Union was organized about two years ago by the interested men of this country to fight adulteration, and every dairy farmer in this United States ought to feel interested enough to become a member of that Dairy Union. It will cost him but $1.00. The officers in that society work for nothing, and they work tremendously, too. They are at work to-day in securing legislation in different states, and they have done more towards this end than any other agency in the United States. I happen at the present time to be its president, and I know that a large portion of my time since last June has been taken up in constant corespondence in the promotion of legislation along the line that was so successful in Massachusetts. We passed a law in Wisconsin which effectually prohibited the making of that fraud and swindle,filled cheese. We passed a law which prohibited any substitute for butter standing in the guise or color of butter. My friends, take this little bit of logic with you,—the farm has the only rightful place in the production of food. The farmer is the only rightful producer of human food. Any man that steps between the farmer and the consumer must do it as an imitator, and an imitator is a counterfeiter, and a counterfeiter is a fraud per se.

I had a letter from the secretary saying, "There is a powerful fight going on in Washington." Now Tom Reed is a politician, and a politician is a creature of the sentiment that is behind him, and he ought to be, too. Well, for your own sake, let him have some sentiment then. Now sit right down, every man of you and write a postal card to Tom Reed or to your members of Congress. I will guarantee that if every dairyman of Maine will just write one postal card to Washington they will think a snow storm from the North has come, and it will stiffen their backs tremendously. The difficulty with us is that we do not make our opinions felt with these men. When the contest was on in 1878 I went home and wrote up a little squib, "Write your member of Congress a postal card," and the agricultural press took it up and my member of Congress wrote me, "For God's sake, let up! I have a bushel and a half of postal cards and you know I am all right." Now you want to just sit down and write a postal card saying, We ask of you to see to it that proper legislation against the adulteration of butter or cheese and the forcing of oleomargarine to take its own place, is had in Congress this winter; and I will guarantee that there will be such a sentiment in Congress from Maine that it will be worth something to the country.

Ques. What class of forage makes the best ensilage?

Ans. Corn seems to have the least loss of any forage we put into the silo.

Ques. What kind of corn?

Ans. We are getting pretty well simmered down to our average field corn.

Ques. I should like to inquire at what particular time it is best to put the corn into the silo?

Ans. About the time that it is through glazing. We have been making some mistakes, we have put in corn too green, and have also gone to the other extreme and put it in too dry.

Ques. Is there any difference between yellow and sweet corn?

Ans. Sweet corn makes very fine ensilage, but that has to be carried to a little riper stage because of the presence of so much sugar in it. It is inclined to make too acid an ensilage, even when pretty thoroughly ripened.

Ques. Should you make a slio round or square?

Ans. I should prefer a square silo, although some people are making round silos. The economy of room is greatest in a square silo. There is no difficulty in making a square silo by chamfering a piece at the corner, to break the corner. The great point is to make the silo deep enough. We have been building our silos too shoal; they should not be less than twenty-five feet in depth.

Ques. What is your opinion in regard to weighting ensilage?

Ans. I do not see any necessity for that. But there is one little thing about covering the top which I think is decidedly a good thing; and that is, when you get ready to finish off the silo just go and cut a lot of green swale grass and put on about two feet of it. The steam and heat from the silo will soften and glutenize that green grass, while if you should put on dry hay or straw the heat and moisture would go right up through it and would not soften it.

Ques. What about pouring on water when you are putting in the ensilage?

Ans. That is a good thing if the corn is too dry.

Ques. If the covering of hay or straw is thoroughly wet will it answer the same purpose as the swale grass?

Ans. It will not, because it has not the gums and juices by which it will glutenize and stick together. The straw is a good deal like the old man's mother-in-law, it stands up by itself.

Ques. How soon is the ensilage fit to feed from?

Ans. In about two weeks.

Ques. What is the difference between putting it in whole and cutting it?

Ans. The ease by which you handle it, one way or the other. I do not know that it makes any difference in the quality. I do not see but it keeps as well when it is put in whole, but more care must be used in arranging it in that case. I have seen ensilage of the finest quality which was put in whole, but it was disagreeable to handle.

Ques. Will not second crop clover do as well as swale hay for a covering to the silo?

Ans. Certainly. Any green stuff under the action of this steam and heat will settle right down and form a most perfect covering.

Ques. If you put in whole corn do you need to take any precautions with the corners that you would not with cut corn?

Ans. Yes. The best plan I know of is to bring the butts to corner; then, if there is any injury, the least valuable portion of the stalk is injured. Also it is a good plan to throw in some chaff or chopped straw occasionally, so as to get the ensilage to settle down tightly at the corners. One of the reasons why silage moulds at the sides and corners is the escape of the heat up the sides of the silo. The heat that the silage engenders is necessary to keep it, as that is the agency by which the air is expelled from the silo. It is canned corn fodder, you know. At the sides this heat keeps escaping, and the result is, it is not carried up to the point that kills the germs of ferment, but simply far enough to promote the growth of mould and fungus. For this reason the sides should be packed down tightly to prevent that escape of heat, and this is done most successfully by keeping the edges of the silo about two feet higher than the middle all the time.

Ques. The ensilage is bound to be acid to a certain extent anyway, is it not?

Ans. Yes, to a certain extent.

Ques. I would like to ask what Gov. Hoard considers an economical feed of grain.

Ans. There are three propositions involved in that question. First, the kind of cow it is fed to. I mean is the cow herself an economical taker of the ration? Second, what is the commercial cost of the ration? Is there anything else that will take its place at less price? Third, what is the most profitable combination of these feeds to secure the purposes you want? Now let me say just a word here. The cow gives a balanced food when she gives you milk. The great argument in favor of the balanced ration is that the cow may receive the proper ingredients, the proper proportion of foods, that she in turn may turn those foods over into a perfect food, that is, milk. One of my patrons said to me at one time, "I wish you would tell me how to construct a ration so that I can get the largest amount of butter." I said, "I cannot do it for butter alone; I will have to give you a ration which I think will produce milk. Milk is composed of so much casein, milk sugar, etc." "Get out! I don't want to know anything about the casein, I just want the butter." I said, "Dear me! If you will show me a cow that gives nothing but butter I will tackle the question at once." We must feed the cow to produce milk sugar and casein in order that we may get milk. As the old man said who loved his toddy and the old lady used to regulate him,—he kissed the old woman in order that he might kiss the bowl. He said he noticed that the more he kissed the wife the more he had access to the bowl. This may be a homely illustration, but the fact is this; you must feed for something that you do not want specifically. You want butter, but you must feed for all the solids in milk in order to get your butter fat. In that way you feed a balanced ration, an economical ration. Taking cows as they run, on general principles (and I can only give you general principles) if the cow is a well bred dairy cow, I would want a ration to include about two and one-half pounds or thereabouts, of protein, about ten or twelve pounds of carbohydrates, or starchy matter, and about half a pound of fat. Take it in that proportion and vary it as you wish. A thousand pound cow will consume in a day only about twenty-four pounds of gross matter. In that twenty-four pounds she should have at least two and one-half pounds of protein. You get that in your concentrated foods.

I want to talk to you a moment on the larger economy in the production of food on your farms; the production of pea meal and bean meal, something to take the place of this costly buying of cotton seed. We are beginning to study this question, and I know that we are growing one thousand per cent more peas than we ever grew before in our history.

Ques. How do you raise your peas? Do you sow them with another grain?

Ans. The most successful way we grow peas is to fall plow a piece of ground, not too rich, and then sow the peas in the spring as early as possible. Select a piece that is high, and get on to it as soon as you possibly can. Sow the peas broadcast and then turn them right over with a plow four inches deep. Do not be afraid of getting them too deep. I have seen so many farmers go fairly wild at the idea of plowing in peas four inches! I sow my garden peas six and eight inches deep. Turn these right over four inches deep, and then in about a week or ten days sow on oats and harrow those oats in. There is a good deal in selecting the right kind of oats. I do not know of any which are so fine to sow with peas as the native Schoenan oat. Sow from one and one- half to two bushels of peas to the acre, and about a bushel of oats. Then, when the time comes,cut them,—when the peas are just a little past the boiling stage and the oats are in the milk, and you have one of the finest combinations, for a rough feed, that I ever saw. In the same way vetches may be sown with oats. Thus you can produce the food on your farm, and if you wish to put it into the silo you can do so, though oats do not silo as well as corn on account of the hollow stalks, from which it is hard to expel the air. Every farmer ought to grow something of that kind, in order to save him from the expense of buying so much food.

Ques. Would you cultivate vetches in the same way as peas?

Ans. Just the same. You can plow the seed in, or you can drill in your vetches.

Herdsgrass growing on the farm of Allen M. Dudley, Castle Hill.

Ques. What about the rape plant?

Ans. The rape plant is not a very good plant for dairy work. It is more applicable to sheep. We are not very much impressed with it for dairy cows.

Ques. What is the relative value of beans at $1.65 in proportion to cotton seed meal at $1.05 a hundred?

Ans. At that ratio the cotton seed is worth more than the beans. The beans are worth to you, of course, if you produce them, what they would be worth in the market. You might produce the beans and buy the cotton seed. There comes in a commercial factor in this question of feed. You must all the time carry with you the question of the price of the different articles of food. I should say that the cotton seed meal would have the largest profit at that price. I do not know what kind of beans are referred to, but we should consider the price high. (Remark. It is the ordinary bean, or the yellow eyed. No stock beans are raised here.)

Ques. What is the relative value of Hungarian, and oats cut green?

Ans. We find that the German Millet, or Hungarian grass, is a very excellent forage in place of hay, and it grows and ripens in about sixty days. It is particularly useful if we find that we are going to have a short hay crop. I want to say, however, that you must cut it before it commences to seed, if you are going to make the best hay out of it. If you do not you are in danger of producing certain derangements in the organism of the cow.

Ques. I would like to inquire what kind of feed Hungarian is for horses.

Ans. Cut in this same way it makes an excellent hay for horses; but after it is headed it becomes dangerous, and is apt to produce serious urinary troubles.

Mr. Jones—I would like to say in regard to beans that there is a difference between the bean that the gentleman referred to in his question as to the relative value compared with cotton seed, and the bean that is to be fed to cattle. It would be foolish for us to undertake to raise the common white bean for food for cows, but there is a larger, coarser bean which we plant in our gardens, and this may be raised to advantage for cattle. I have raised thirty or forty bushels per acre, and I think sixty could be raised if you fertilized high enough. John Gould was at my place last year and saw me feeding this bean meal, and asked me how I liked it. I told him I thought it took the place of cotton seed very well. He wrote an article about this,and I had more than forty letters from different states in regard to it. We want to raise this bean and save the cotton seed.

Mr. King—I want to add a word upon the economy of feeding. I remember well a lesson which came to me very forcibly, and which has been of use to me in my farm operations. It was a fact brought out in a paper presented some years ago by Brother Knight of Turner, which illustrates that many persons do not know how to feed their cows for their best financial interest. He had statistics carefully gathered from the owners of eight or ten different herds, who sent their cream to the Turner Center Creamery. Of those eight or ten men, the man who for the year had bought the most feed for his cows and taken the best care of them, at the end of the year could show $12 more per cow, clean profit, than any other man.

Ques. What is the relative value of the gluten meal which you get from the Buffalo factory, and cotton seed meal, one costing ninety cents a hundred and the other $1.15?

Ans. I am using the Buffalo gluten feed. So far as my own experience goes I do not know of any feed for the money that produces as good results.

Ques. Should not the kind of coarse fodder that a man is feeding to his cow govern him somewhat in his choice of grain feed?

Ans. If he has plenty of clover hay he does not need quite so much of the costlier protein food,—he does not need quite so much cotton seed. But I am confronted all the time with the fact that hay is worth so much more with you than with us. I am told that hay here is worth from $10 to $15 a ton, while good hay can be bought in Fort Atkinson to-day (and I never saw so light a hay crop in my life) at from $8 to $10 a ton. With plenty of clover hay you can save yourselves in the purchase of cotton seed to a certain extent, because clover hay is like cotton seed in that it is a protein plant. If you have good pea hay, or vetch hay, or pea and oat hay, or vetch and oat hay, you have a substitute in a certain sense for the heavy protein feeds that you buy; but the cow would have to eat a large quantity to get as much as you would find in a pound of cotton seed, and therefore it seems to me necessary to give a little of the heavier feeds. Timothy hay is a carbonaceous hay, and in my estimation not a good hay for milk, though many men think it is, and I am not disposed to combat them vigorously. But I can get cheaper carbonaceous foods in corn fodder, millet, and many other things. It is all a question of the chemical character of the food and then the price of it.

Ques. How is red top?

Ans. Red top is richer in protein than timothy, but not so rich, as a rule, as good clover.

Ques. Would you advise feeding cows at noon, when they have their breakfast at 6 o'clock and their supper at 6?

Ans. If I had established a habit with my cows of feeding three times a day I would keep it up; but if I had established a habit of feeding at morning and at night, I would keep that up. About a year ago I was suffering from a severe attack of indigestion, and a friend of mine suggested that I go without my breakfast, and I concluded to try it. It was considerable for me to overcome the habit of having my morning coffee and a light breakfast, and for a week the change of habit produced a severe headache, though after I had broken through it, it was a wonderful benefit to me. I figure something in the same way with my cattle. If I have established a habit, I should question the advisability of a charge, but I should consider the better habit to establish to be feeding twice a day.

Ques. Would it be the same in watering?

Ans. I think not. I think a cow is a good deal like you and me. We all vary in our thirst, but not so much in our hunger. The taking of water is a different thing from the taking of food, and I know that cattle get very thirsty. I have watched a cow to see how many times she would drink in twenty-four hours when left to herself,—even gone without my sleep to find out. And how many times do you think the cow went to the trough and drank during twenty-four hours? She drank eleven times, and it was remarkable that she drank the most at night.

Ques. Do you think there is a difference in cows in regard to that?

Ans. I do. I think other cows will not drink as much, but I have noticed that the cow that gives the most milk will drink the most water. The taking of water is very largely in proportion to the drainage of the system of fluids in any manner. If the drainage of fluids from the system is large in any direction, the animal necessarily has recourse to more drink. Another point,—lots of men believe you can take ordinary water and mix it with feed and it will be the same as succulent foods. My good friends, this water that is in the food has a wonderful, mysterious effect upon digestion, and it is worth a good deal more than the water she gets from the pump. I will guarantee that any man of this crowd would know that he could not soak a dried apple and have it amount to as much as when it was juicy with its original water. The finest condiment in the world is a fresh bite of grass. When your cows or horses are out of condition, if you can turn them out on a fresh bite of grass, that is the finest medicine ever given to an animal.

Ques. Is there any serious difficulty to farmers in the line of the adulteration of cotton seed meal?

Ans. I do not know what cotton seed meal could be adulterated with, except something that would add to its weight. But I have found in New York men selling machines to millers to grind up this white St. Louis corn bran with ordinary bran, to whiten the bran enough so that men will pay for middlings when they are getting ground bran. If I were going to buy bran I would buy the poorest bran I could get, the lightest, not to exceed twenty-three to twenty-five pounds to the bag. The flakiest, coarsest bran I can get, which almost every farmer tells me is not good for anything, is the bran that I esteem worth the most for feed. I know that in the eastern markets, in particular, this grinding up of the outside hull of the white corn, which I do not consider worth anything, together with bran, so that the bran may be sold at an increased price on the claim that it is middlings, is practiced.

Ques. What is the difference between bran and shorts?

Ans. That portion of the flour, or wheat, which, for instance, is not considered fit to throw into the barrel, is thrown into the bran as refuse flour, and that mixed with bran is called shorts. It is the same thing as middlings. I never could get as good results from shorts in proportion to what I had to pay, as from this flaky bran, but men do not always agree with me.

Remark. I think there is a confusion of names, and what is called bran in Wisconsin is generally called shorts here. What we generally term shorts is the coarsest of bran. What is called bran in Wisconsin we sometimes call bran, but generally shorts.

Mr. McKEEN—What about warming the cows' drinking water in the winter?

Ans. I think I told you the story about my wife. She is not a dairy woman, but she is a mother, and she taught me more about some of these things than all the dairymen that ever lived. When she was nursing our youngest son,—he was a lusty boy of eight months and she a delicate woman,—we were riding together in a very cold day, and she took a sudden chill. Her mother instinct was at once touched, and she said, "I am so sorry I have taken this chill!" I was interested and asked her why. She said, "It means so much less for the baby." I was interested again, for I was deeply engaged then in studying this physiological problem, and I said, "What will you do to recover your power?" She says, "You ought to know, yourself." I said, "I suppose a man ought to know a heap, but he doesn't sometimes." "Why," she said, "I will get warm, I will restore the warmth to my body as soon as I can and I will take warm drinks." Her mother judgment taught her what to do to restore this secretion. I knew that my wife as a mother and my little Jersey as a mother were identical in the operation of feeding, and when I got home I went to experimenting with that little bovine mother. I turned her out into the bitter cold and saw her shrink in her milk, and I gave her warm water and saw her recover, and I proclaimed to the world what I learned in the giving of warm water. I thought I had made a great discovery, but when I came to look the matter over, there was not an old woman in the land who had not known it for years.

Ques. You have been advocating the best form in cows for milk production; can you give us any instruction as to how to go to work to get the most perfect animals possible?

Ans. I suppose you would ask me what I would do to bring up a herd of cows to the best production. A gentleman in Fort Atkinson, who was a very successful dairyman during the last years of his work, and who has become rich in dairying, and is now rich enough to retire and lives in that town, said to me a few years ago, "If I could have known in the previous twenty years what I have known in the last five, I would have been worth more than double the amount of money that I am, but it is too late now. I have got to be an old man." He came to me about sixteen years ago and said, "I have a herd of high grade Shorthorn cows. The best I can make those cows do is 150 pounds of butter apiece, and when I undertake to crowd them in any way I notice at once that when they get up to a certain pitch they commence to fatten, and away goes that feed. They begin to flesh up, and consequently shrink in milk. I wish you would tell me what you think I had better do." "Well, Mr. McPherson," I said, "I do not think if I were you, that I would undertake to go out and buy the Tom Fool breeding of everybody, with the idea of making myself better off. I would purchase the finest dairy sire that I could find in the country. I would rather pay a good, high price for that very animal in your work than I would to put him into a thoroughbred herd." Finally he said to me, "Tell me where to buy such an animal." I had some correspondence with different parties, and he finally purchased a two-year-old Jersey sire. Then I said to him, "I would take his daughters,—they will be one-half Jersey,—and I would breed them to their own sire, and that would give you in time a herd of cows three-fourths Jersey in breed, with only one-fourth of the original Shorthorn mother, as a foundation stock. His Shorthorn cows were all strong and healthy cows, and made first class Shorthorn stock. And I want to say now that both the Jersey and the Guernsey nick very kindly with Shorthorn and Ayrshire blood. In breeding there is what we call a right nick and a wrong nick, and the Holstein and Jersey as a rule do not seem to nick kindly.

In the course of time Mr. McPherson's herd were the granddaughters of that original sire. They were not inbred any more after that, but were bred to a sire out of the same family from which the first one came, which is of general fame.

In 1888 those granddaughters produced 336 pounds of butter per cow. You can see that there was a constant weeding. This sire was kept until he was seven years old, and there were a great many successive granddaughters that came in the same way. He was careful in selection, he was weeding, selling off and constantly breeding in this way, until these inbred granddaughters showed in three generations an increase from 150 pounds of butter produced by their mothers, to 330 pounds of butter per cow. That simple story contains my idea.

Mr. King. I thank Gov. Hoard for bringing up that point. It is one I have always believed,—that with a strong solution of prepotent blood it is possible to build up beyond the expectation of anybody who has not followed the question closely. Now I would like to ask whether the gentleman did any better than he could have done with the same care and the same weeding from a thoroughbred Jersey herd.

Gov. Hoard—No; but he started with ordinary foundation stock. He was trying to do the best he could with what he had. If you ask me what in my judgment I would do,—I would get into thoroughbred blood just as quickly as I could, because every animal then has a certain breed value as well as a performing value. I told you of Gen. Burchard's herd of thoroughbred Jerseys in our Home Creamery, and the amount we paid him in cash, besides returning him the skimmed milk. When a man tells you that grades are just as good as thoroughbreds,—that depends. A thoroughbred man can make more out of thoroughbreds than a grade man can make out of grades.

Prof. Jordan—I want to say just a word before leaving the hall. You know it is sometimes said that one can find out what people think of what he says, often, by the comments afterwards. A lady who was in the audience this morning came to me and said "I heard a gentleman sitting near me say, 'Well, it is of no use to buy any more grain'." And I thought that if this audience, or any portion of it, had acquired the notion that I did not believe that food amounted to anything, I had better say something. I cannot for the life of me imagine how anybody could get that idea. I believe in grain food, as a tremendously important factor in dairying. Just how to feed, when to feed and how much to feed,—upon that depends the success of dairying, very largely. What I was trying to show up this morning was the idea of playing upon the quality of the milk at will with the food. We have no experiments yet which determine what effects long continued processes of feeding are working out, through a change in the constitution of the animal; but we have experiments that mean a good deal with reference to what I was trying to talk about this morning,—as to whether sudden and peculiar changes are made by food, in moving up and down the percentages of the various constituents of the milk.

Feed the cow the very best you can, study the question of foods, of balanced rations, for upon the way in which you feed will depend your success in a large measure.

One of the things that impressed me to-day was the definition which Governor Hoard gave of art,—"The ability to see." The purpose of the State College is to enable people to see; not the old men so much, but the young men; those are the ones that we wish to make see. You demanded an institution of that kind, and I maintain that you are not, as you should, keeping faith with the institution, with the National Government, with the State Government, unless you send us more young men that we may make them see. A gentleman who has been speaking here to-day came to me and in a jocular way said, "Professor, could you do any better farming than we because of some of the things you told us this morning?"

I said, "Sir, that will depend very much upon whether I am a better business man than you are, or not. If I am as good a business man I can do better work because I know those things." Is agricluture the only profession or business in this country in which intelligence is at a discount? Is the modern knowledge of no account? And is there a young man in this room who proposes to be a farmer who is willing to do less than to get the best he can, and are we of no use to him?

FRIDAY EVENING. MEETING CALLED TO ORDER AT 7.30 P. M.

Mr. VINTON—There is a little matter that I wish to refer to for a few moments, and I think I will take this opportunity to do it. In these meetings we have the largest liberty to say anything that we can think of, but we are always good-natured—never get up a controversy. This forenoon at the end of Prof. Jordan's very able lecture he had an addendum, in which he pitched in with a most unmerciful scathing of Nutriotone. Now that hit some of us, and if we ought to be hit that is all right. Since that time three or four good men have punched me and said, "You have given a recommendation of this thing, and what is it all about?" Well, I have given a recommendation of this very thing that has been so unmercifully scathed here to-day, over my own signature, and men have a right to punch me, as things now stand. But I am not alone; there are other men here who have recommended it. Here is Mr. Daggett, who is on record as recommending it; here is Mr. Gilbert; and down in my own county there is Byron Kimball, one of the most level headed and best farmers, who has recommended it. And the strongest recommendation of all has been given by the Rickers that run the Poland Spring House. Now if this article has no redeeming feature it ought to be thus unmercifully scored,and we are all wrong, surely, and ought to repent. For myself, if I am in the wrong and am convinced of the fact, I am willing to admit it; and you cannot say anything here or anywhere else in condemnation of patent medicines, that I will not endorse. But in regard to this article, inasmuch as we are on record as recommending it, it does seem to me that we are placed in a false light. We are either right or wrong in regard to the matter. I have just this to say, which is what Prof. Jordan said in his admirable lecture,—I submit the evidence. I had a colt three years old that was called a very valuable colt; I had paid $75 in cash for the use of the sire. I wanted a good colt and I had a good colt. He was taken sick, and grew worse and worse. I had two veterinarians, but he grew worse and worse and I expected he would die. I got some of this article and gave it to him just according to the directions. He soon began to mend, and mended rapidly, and in a short time was well, and has been well ever since. The Rickers give us very strong testimony to the value of this article. They tell us that, with their large number of horses, they never have had anything that keeps their horses in such good condition. A member of the Board said to me this afternoon that he would give a dollar a pound for it if he could not get it without. Three weeks ago I had a valuable cow that was taken sick. She would not drink, she shrank up in her milk, and a quarter of her bag caked up badly. I did not have any Nutriotone, but I went to the store and bought some and gave it to her according to directions, and in two days she was well. Now that is on our side. As I have given a public recommendation, I will say exactly what I did in the recommendation, that I believe it is a tonic. It is not a food, and I have said to their most active agent in this State that they should not claim that it was a food; although we all know that anybody who has any patent medicines says what he likes, and people may believe just as much as they have a mind to. I will agree with Prof. Jordan that it ought not to be put upon the market and pressed with all its vigor as a food, but I do believe precisely what I said in my recommendation, that it is a tonic, and I believe it is valuable as a medicine for horses. I know Prof. Jordan says that they ask four or five or ten times as much as it is worth, and that you can go to the druggist and get the ingredients and mix them yourself. This is precisely the argument that is used in regard to phosphates, but we farmers do not do it, we say it is not practicable, let somebody else do it. As I said, if this article has no redeeming feature whatever, we are all wrong and ought to repent.

MR. McKEEN.

MR. CHAIRMAN, LADIES AND GENTLEMEN: I wish to say that we have here an exhibit from the factory of the Maine Condensed Milk Company at Newport. It arrived late and was not placed on exhibition. I understand that they are doing quite a good business at this factory. It is a new dairy industry in the State of Maine, and for that reason deserves notice in a meeting of this kind. You will notice that they have four different brands. I understand they are selling it freely through the South and portions of the West. And while up to the present time the furnishing of milk for the manufacture of this product has not given the farmers the encouragement that it was supposed it might, I believe that in the future there is a chance for a profitable output in this direction. It is an encouragement for us as Maine dairymen that we are extending the variety of our dairy products, placing them upon the market in various forms, forms that were not known in former years.

You are, no doubt, all of you familiar with the fact that through the efforts of the board of agriculture and the members in our

Twenty acre potato field of Mr. Columbus Heyford, of Presque Isle.

legislature who are friendly to the farmer's interest, we had our laws regulating the sale of adulterated food products changed at our last legislature, in compliance with the bill which was presented by Ex-Secretary Gilbert for that purpose. So that we now have, as we believe, in common with most of the other dairy states in this Union, one of the best laws that it is possible for us to frame at the present time, for the purpose of excluding oleomargarine and butterine from the markets of our State when put up in the form or semblance of butter. There is nothing in this law which prevents them from being sold when put up in a form so that they will not be mistaken for butter, but will be sold for what they are. The passage of this law has placed a duty upon the board of agriculture, and upon every citizen who believes in the honest enforcement of our law; and I trust that we shall none of us be delinquent in our duties, but shall see to it by every means in our power that this fraud is kept at a distance, and our markets relieved as far as possible from this unjust industry. As a representative of the board of agriculture, I request the earnest co-operation of every person in the State, whether a producer or a consumer, because the consumer has a direct interest just as much as the producer, as he has the right to know just what he is eating and paying his money for; and I believe it is impossible for him to do so if these articles are put up and sold in a form which resembles butter.

MR. ELLIS.

MR. CHAIRMAN, LADIES AND GENTLEMEN: The idea of a man of my calibre appearing before you at this stage, after the big guns have all been fired, seems very preposterous, but there are a few things that I want to say, nevertheless. In the first place, the audience here are not amateurs in the dairy business. They all understand the business as well as, if not better than, I. So it is no use for me to tell you that it is necessary in the dairy business to get the best of cows and give them the best of care, and all that, for you know it as well as I. But there is one item in the matter of feed that I do wish to speak upon a minute or more. I think that the farmers as a rule do not experiment enough in feeding. The feeding tables do not always correspond with my experience. I have experimented in feeding more than in any other line in the dairy business, and I find that the richer the feed, the richer the ration in protein or albuminoids, the cheaper I can make the butter, and the better pay I get. And I believe that the ratio of 1 to 4, 1 of albuminoids to 4 of carbohydrates, will give better results than the wider ratios of 1 to 5½ or 6. There has been a ration established as the American Ration. A certain gentleman, by the name of Wool, I believe, sent around to a hundred different stock feeders in the United States and asked them to give the ration that they were feeding. He got replies from these one hundred feeders, and when he took the average of those replies it amounted to 1 to 7, a wider ration still. But I ask you, gentlemen, what that proves. He did not get the result from the ration in any case. A hundred men may be feeding thus and so, but if they do not give us the results, what do we know more than we knew before. We do not know whether the result was better or worse than it would have been with a different ration. I wish every dairyman in this State would keep an account of what he is feeding, and note the results, and report them; then we might get something that would be of some benefit, though we could not get anything definite then, because herds differ very much. But it would be a little better than to simply ask what they are feeding and average it, and take that average as an American standard for feeding. I wish that every one of the farmers would weigh and measure his feed, and weigh and measure the results in butter or cream, and report that, and then we can get at something that will be in a measure tangible. It would be better still if they would feed different feeds and note the results, and compare one with another.

I think there is one great lack with the dairymen of the State of Maine. My brother who started this discussion went to a certain point, and showed you what we have got to have, according to his idea, to bring Maine butter up to the right standard, and make the dairy business more profitable; but a great lack, in my estimation, with the dairymen of Maine, is their want of faith in their business and faith in one another; that faith that shows itself by works. We cannot do anything as dairymen in the State of Maine with here and there a man who has three or four or five cows, and the cream-gatherer has to travel all over creation to gather the cream. The cost is too great and the butter is too poor in quality. With cream churned but once or twice a week, skimmed by the patrons and kept in any kind of a place that they may have to keep it in, you cannot make butter of the first quality. This is where the gentleman who opened this subject stopped a little too soon. He said, and I agree with him, that the only way out of this difficulty was for the creamery men to collect their cream every day. That is all right, but can the creamery men afford to collect their cream every day when they have to go ten or twenty miles to get only what they ought to get in going four or five? If they do that it will bring the cost of making the butter so high that the farmers cannot get as much as they do now. I doubt if the butter would bring enough more to offset the extra expense in collecting the cream every day. What we want is for the dairymen to have that faith in their business that they will stock up their farm to the fullest capacity with cows, and then the creamery man will not have to drive all over creation to get a one horse load of cream. We do not have the faith in the business and in one another that we should. That is the crying evil with the dairying business in the State of Maine. We are too afraid that our neighbors will get a little the start of us. We ought to know that the prosperity of our neighbors in this business is our own prosperity. It would be vastly better for me if every farmer in my neighborhood were keeping fifteen cows; I should be the gainer.

This summer I took a little trip to Vermont, and visited one factory in Ryegate that I want to give you a little account of. I climbed up 2,000 feet above the level of everything else, and found a creamery manufacturing from four to five hundred pounds of butter a day with thirty patrons. Aside from a few men right around the village who kept a cow apiece, they had only about thirty patrons, but those patrons kept all the way from twenty to fifty cows. They brought their milk there and put it into the separator and took back the skimmed milk. The operator of that factory told me it cost only two cents a pound to make that butter, and in from forty-eight to seventy-two hours after the milk was drawn from the cows the butter was on the market in Boston. That is the way to do business. The outside patron had to bring his milk only about two miles. Every patron's whole heart and soul was in his business, and he had his farm stocked to its fullest capacity. They have no better natural advantages in Vermont than we have here, except, it may be, in having their farms set up edgewise so that they can cultivate both sides. They cannot cultivate the soil nearly as cheaply as we can here in the State of Maine. We have all the natural advantages that are had anywhere in the wide world. There is no place under the canopy of Heaven where they have any sweeter grasses, any clearer water, any purer air, any brighter sunshine, or half as many women as we have here in Maine. We have no right to complain about the poor success of the dairy business in Maine. I can show you a hundred locatlites in the State of Maine where we can carry more cows to the acre, or to the ten or twenty or fifty acres, than they can carry in Vermont. They cannot concentrate, as a rule, in any one locality, as we can here in Maine. All we want is the disposition, and the faith in our business to take hold of it with all the energy we possess. Instead of complaining about this, that, and the other, let us stock up our farms to the fullest capacity, and go into this business as men.

We want to double up our pluck and ambition, and double up our cows, and there is no trouble but that we can succeed here in Maine as well as anywhere.

OTIS MEADER.

Mr. CHAIRMAN, LADIES AND GENTLEMEN: Although I never got up quite so high as Brother Ellis says he has, I have nevertheless had some experience in the matter of dairying, and I fully agree with him in his remarks, especially in relation to doubling up. I believe that is the need of the dairy industry of Maine. The great trouble is in the scarcity of cows on our farms. It is simply impossible to manufacture a fine article of butter with two or three cows. It places the dairyman, or dairywoman, who undertakes it, in very unsatisfactory and damaging circumstances. No matter how well the dairyman may be versed in the manipulation of the product of the cow, it is impossible for him to make a good article of butter under those circumstances, from the fact that a fine article of butter is never made, as we have heard remarked to-day, from old cream. The idea of keeping cream for a week, under ordinary circumstances, and expecting to make a good article of butter from it, is simply ridiculous to any one that understands the principles of the business.

Now this question of dairying opens a large field for discussion, and to do it justice in ten minutes is impossible. If there is any point that any one would like to have me speak upon I would like to have him indicate it by asking questions.

Ques. In your dairying what do you consider the three most vital requisites?

Ans. The first I should consider was a cow, the next a dairyman, and the third I should think might be a market.

Ques. Which is the most important of the three?

Ans. I should say the cow might be, for without a cow dairying would be impossible.

Ques. If you had the right kind of a man wouldn't you get both of the other requisites?

Ans. I think the other two would follow if you had the right kind of a man. These subjects have been ably presented during the session of to-day. The subject of cows and the means of obtaining them was very clearly and satisfactorily presented by Gov. Hoard in the little story that he related. That is perfectly practicable, and is my own experience in getting up my own herd. Any one else can do the same by taking what cows he has, and if he has not enough, purchasing such ones as he can get. I never believed nor advocated any one's starting in with high priced cows unless he had plenty of money to do so without danger of becoming embarrassed in the operation. After getting the cows, the method prescribed by Gov. Hoard is a perfectly plausible one. The great trouble with the dairy business at the present time is the amount of poor butter that is made and placed upon the market; and the cause of it is largely, as I said before, the want of cows enough to conduct the manufacture of the butter as it should be. This kind of butter is made, and as it is of no use to send it to a regular butter market, it is sold at the nearest grocery store, or swapped for goods. It of course has to be sold at a low price, but generally more than it is worth. The groceryman dares not say that it is poor butter, but takes it and pays what he thinks he can afford, or what he has to, and the person who puts a good article in the same place is the sufferer for it, for his article is bought at the same price, and is of course expected to help the trader out on the other. It is this article which I speak of, this poor butter, which causes the over-production, if there is any, in the dairy business. There is no over-production of the fine article. There is a sale for it at a good price any time.

Ques. Isn't there danger of glutting the market?

Ans. I think not. I am a firm believer that if we had double the cows in Maine that we have at the present time, we should have a better market than we now have. We have been told here that Maine butter is at a discount in our great markets of New England, and it is on account of the facts that I have just stated, on account of its low quality. Other states have a reputation for good butter, and it is a well known fact that Maine is as capable of producing such butter as any other state. Other states have a quotation in our markets, such as "Vermont butter" and "New Hampshire butter." Maine butter has no such quotation, and I was told to-day by a dealer in butter in Boston that to tell a customer that the butter was from Maine was sure to reduce its selling value one cent a pound. That should not be; and if we do as we may, as we can easily do, it need not be.

Ques. If the dairy business is not overdone why is it that the price of the butter is so low?

Ans. I have just stated that it is in consequence of the poor butter placed on the market. Another reason is the condition of the times for the last year or two. Gov. Hoard was relating his own experience to-day, in that direction, to illustrate the effect upon the fortunes of the farmer of destroying the business of the consumer. Perhaps he will tell you about it.

Gov. Hoard. In 1892 we were furnishing 3,000 families with butter, and they called for $15,000 worth more butter than we could produce, and we had to buy it. In 1894 the same families left us with $16,000 worth surplus on hand, which made a difference of $31,000 with us, caused by their lack of consumption because of their lack of business. Every family was just simply under the pressure of the times, and was reducing the amount consumed all they could. This was a reduction of cousumption, which, in its effect on the market, amounted to an overproduction. In prosperity the people consume butter freely, but in adversity they economize, and the market is over-stocked. But if we manufacture such an article as the trade requires, and let it take the place of the poor butter, there is little danger of glutting the market.

W. H. MOODY.

Mr. CHAIRMAN, LADIES AND GENTLEMEN: I am the first man that has spoken to you since the meeting began who does not have any particular title or handle to his name. I do not know what I am here for, but I suppose to fill up the time. I remember at a great political meeting at Old Orchard Gov. Morton spoke for a couple of hours, and when he had finished they called upon Frederick Douglas. He told them he was not prepared to speak, but he said, "I came here to listen. And I came for one other purpose,—because no political meeting would be complete without a negro in it." No dairy meeting would be complete without three or four farmers that did not know very much.

The gentleman who preceded me assumed that associate dairying was all the business we could do; I am going to speak for a few moments about private dairying, because about associate dairying I know very little. Seven or eight years ago Mr. Light, who is in the associate dairying, or creamery, business, and I, wrote to Secretary Gilbert when he was secretary of the board, to come down into Knox county and have an institute. He came and brought some gentlemen with him, Prof. Gowell and Mr. Ellis, and they talked to us about dairying. And we got such a knowledge of it and such an impetus that we started right away to do a little business. I want to tell you the method that I adopted, because I was successful. You may have the finest apparatus in the world, and make a large quantity of butter, but you may not be successful. That is, you may not have money to pay your bills with. I got out of it and was successful. I started with a very little money. Of course it necessitates putting up ice if you want to work the method of the deep setting. I made me a tank in the first place; I made a box and lined it with zinc, and bought my cans and put the milk in them, and began to raise the cream and churn. I succeeded in making some good butter, and sold it for twenty-five cents a pound, and my cows produced over 300 pounds of butter the first year. It is not worth while to go into the details of my method of cleaning the cows and skimming the milk and all that sort of thing; we all know that everything must be cleanly.

If you cannot do associate dairying, then do some dairy work yourself. I have talked to the people round about me, and I think that from that Institute has grown up quite a large dairy business, and it is on the increase, and people are being benefited. I konw of a good many men who have gone into the dairy business in a small way and kept adding two or three cows a year, and found a place where they could sell their butter at a fair price, and they are making some money. I assume that there are farmers here who set their milk in pans and do business in the old way, selling their butter at sixteen to twenty cents a pound, and to you I am talking. Put up some ice, get some kind of a tank, and try the experiment. By and by if somebody starts a creamery, and you see fit, you can join in it, but you can make butter yourself, and make good butter, and sell it, too; and be working up this thing gradually so that when the time comes around that the creamery man is there you are ready to meet him. If there are any farmers here who are working the dairy in the old way, I think if you will make that change you will be greatly benefited by it. It does not cost much. It cost me only fifty cents a ton to get my ice, and it need not cost you anything if you can get the ice yourself, and then you are on the right road, and intelligent men and women can find out a great deal by experimenting. I think you will find that you are going in the right direction, and in a few years you will find that you have something in the pocket where you did not have anything before.

MR. GEO. FLINT.

MR. CHAIRMAN, LADIES AND GENTLEMEN: The question of over-production at the present time seems to depend very much upon the cost of production. This answers most of the questions as to whether we shall fear competition and lessening of prices. Such a thing is possible, and I know of no possible way to meet it, but by availing ourselves of every possible chance to cheapen the product. The discussions in the dairy interest seem to centre very much around the silo, and to stop there. They should not be left there. There are other factors besides the silo which come into the question of cheap production, which need as much attention as that. The production of other feed, the protein and albuminoids,to make up what is known as a balanced ration, should be the study of the farmer as much as the price of western products. And I think if the farmer will give as much attention to the home productions as he gives to the prices current of western products and the quality and quantity of the western feeds which he should get, he will in a great measure overcome the chances of cheap prices resulting from over-production or under consumption.

T. E. SKOLFIELD.

MR. CHAIRMAN, LADIES AND GENTLEMEN: I don't know as I can say anything here now. I am not an expert, and after hearing all that these experts have said,I feel something like the cheese that they told about, full of microbes and bacteria. I think there are others here who could say something pertaining to the subject better than I can.

The State of Maine appropriates money, which the people are taxed for, and a part of that money is allowed the board of agriculture;

and the board of agriculture takes a part of the money that is allowed them for this meeting. They bring machinery here and procure speakers, and the people are taxed for it, and I hope they will come and listen and get all they can from what these men have said. We can carry home and retain but little of it, but I hope we shall take with us what we can, and profit by it.

PROF. GOWELL.

Mr. CHAIRMAN, LADIES AND GENTLEMEN: I suppose the vital purpose of this meeting,and of all our conferences,is to secure information; and there is something aside from the lectures that we have here which is of importance, and I think of quite as much importance, at least, as any of the lectures have been, and that is, the exhibits. We come here as creamery men or private dairymen to learn something of better methods. We are at work largely by ourselves at home, and we want to come together at some point so as to study what others are doing. For that very purpose these dairy conferences were established. And in coming here we come directly in contact with the goods other creamery men and private dairymen are manufacturing, and are trying to educate ourselves into the knowledge of what good butter is. We must know what perfection is, and aim at that perfection, else we have no guide board. It is in that way that we get the most benefit from these conferences. I have been very much interested in seeing how the people have gathered about those cases and discussed the quality of the butter there, and I am glad to know that the cases have been open for inspection as much as they have. This is the very key stone to success,to the manufacture of a better quality of goods on our farms and in our creameries. We have brought here for the past two years the best expert that the Boston market affords, to judge these exhibits, and he has done his work intelligently and conscientiously. He is every day dealing with the finest class of goods sold in Boston markets.

It is not merely this dairy conference that gives us our opportunities for education in the dairy science. We have our two State fairs, and the same products are there,and the same people go there to study them, and many others. But are we being used just right in the work that is being done at our State fairs? You know there is no fun in anything unless you find fault all the way along, especially with some individuals, and I want to be in the swim. I do not think the dairy interest is best secured in the way the society has proceeded in the selection of judges at the State fair. I do not believe satisfactory work was done last fall. An expert was obtained who used the sample of butter which he brought as his standard of excellence. He was not so well versed as to do his work without a sample. We cannot have confidence in that kind of judging. We are all dairymen, and at the same time we are all convened here,and it is a good time to talk about this. We are stock growers, and we gather at the State fair for the purpose of obtaining information in stock-growing. Go with me to the cattle stalls and stay there from early in the morning until late at night. You will find the farmers, the breeders, the dairymen, studying the quality of those animals. These young farmers who are at work at home by themselves are there studying the score cards, so as to educate themselves that they may know what a good animal is. They study this animal that is a perfect type, to train themselves into the knowledge of the perfect dairy animal. And they study that animal from a standard of excellence which they regard as correct,because it was established by an expert judge. Now suppose the judges in those classes of stock are not experts. These men unacquainted with the stock industry are given wrong impressions of what a desirable animal is. Now the point is simply this; our State society brings in to us a man from outside the State, as we want a man from outside the State so that he will be impartial, and the same individual is asked to judge Jerseys, to judge Ayrshires, to judge Holsteins and to judge Shorthorns. Now it is impossible for a reasonably expert man to judge in all these classes and to do perfect work. No man who has engaged in the breeding of Jerseys for a period of years long enough to make him an expert in that class can go on to another class without bringing in his standard of excellence for the Jersey. If he judges Shorthorns he will be looking in the Shorthorn for the narrow, thin, attenuated neck that he knows exists in the Jersey. He will be judging that Shorthorn by the Jersey standard. Now I believe that we should protest against judges being allowed to act in more than one capacity.

E. E. LIGHT.

Mr. CHAIRMAN, LADIES AND GENTLEMEN: My brother gave you some description of my business, as well as his own, and I do not know as there is much for me to say. I cannot say that I have not been successful. Beginning in a small co-operative way, and buying cream from three or four families by the inch, the business has increased with me so that I am now distributing about $1,000 a month in that vicinity; and that community was without any previous dairy knowledge,excepting such as would be found in any community where they keep only a very few cows and practice all the primitive methods of butter-making, without any established or reliable market. I began buying cream by the inch and continued it for a few years. But on learning of the Babcock test, I was one of the first creamery men in Maine to adopt it, and I continued by that system until about two years ago. Then I used what is known as the Goss space pail with the Babcock test. But the first of last April I made another change, and since that time I have been buying cream by weight,and testing a sample of each lot by the Babcock test to determine the amount of butter fat, and paying the patrons for the butter fat the same price that I receive for the commercial butter. I have practiced that system since the first of April with very satisfactory results, and I regard it as fair,just,and equitable,and would not hesitate to recommend it for general adoption by the creameries of this State, especially proprietary creameries. And I am not clear but that it would be as good a method for co-operative creameries as any. I was impressed by the remarks of Brother Ellis in regard to the lack in the number of cows in the State. I think the board of agriculture should direct its attention toward the increase of the number of cows that are kept in the State, instead of going into these fine points of which I have heard so much. They are all very well, but I do think the agriculture of Maine to-day demands an increase in the line of dairying, and that work should be done by the board of agriculture in that line first.

Gov. HOARD.

Well, this is a sort of hash anyway, so I will have to talk to you in a fragmentary way, which will be a sort of running comment.

First, relative to churning. Talking with some gentlemen at the hotel to-night, it occurred to me that I might drop a hint here relative to churning. You have heard a great deal about the necessity of testing your churning. If we test our buttermilk every day by the Babcock test, why should not every person in some way test his churning to find out whether he is wasting butter fat or not. If you have not a Babcock test let me offer the following suggestion. When you have brought your butter to about the mustard seed size, and have stopped the churn with the butter in this granular state, the first thing you do,—say for instance, you have fifteen or twenty pounds of butter and want to be sure to get all the butter out of the buttermilk,—make up a little strong brine, for that amount of butter perhaps a quart, and dash it into the churn. That will compel all of the butter to come to the surface at once, for the reason that the salt water makes the watery contents so much heavier than the butter that all the fine particles of butter will come straight to the top. Nice, rich buttermilk means wasteful churning always. You cannot afford to churn your butter in that way.

The cost of the butter, which was given here to-night in Prof. Bartlett's report, was twenty cents.That is altogether too great. It is too great in Maine, where the price of feed is so much higher. Remember that the cost of the butter made from the cow Dido was 12.2, and the cost of the butter produced by the cow Dora was 8.8 cents per pound. You see the difference in the cost of the butter from the two cows. How did Prof. Hacker at the Minnesota Station reduce this cost? He did it by a wiser administration of the forces by which these cows were supported. He fed skilfully, and in that way reduced the cost of the butter. I cannot help believing that the parties who reported the cost of this butter at nineteen and twenty cents have reported it a little too high. I cannot believe that it costs that much to make butter here in Maine. Something is the matter when it costs nineteen and twenty cents a pound, either the cows are poor cows or the feed is costing high, or else the management somewhere is wrong.

Let me give you a little hint on the management of a young heifer. If you desire to have a heifer become an easy fall freshening cow, start her that way first. A great deal is said to you about the value of winter dairying, and you ought, as much as possible, to make your butter in the winter, and not have your cows come fresh in the spring. But when cows have come fresh for two or three years in the spring, it is a hard matter to swing them over into the fall and hold them there. But you can always succeed very well with your heifer if the first calf comes in September or October. She will swing that way quite naturally thereafter. Another thing about the young heifer, milk her for her first milk just as long as you can, even if she does not give a teacupful. Do not dry her off for at least ten months. If you dry her off at six or seven months with her first calf, you will be bothered very much to have her give milk for long periods afterwards.

Shall we sell milk, or make butter or cheese? You have heard something here about over-production in butter-making. Let me say the cows are being enlisted with great rapidity in another direction. To-day not forty per cent. of the milk produced in the United States is made into butter and cheese. Fully sixty per cent. of that milk is consumed fresh in the cities in various ways. There is a constant enlargement of the cities all over the land, they are growing with great rapidity, and the country population is decreasing,so that you see the question of over-production is not a very serious one, for any man to contemplate. Then again, the question of whether we shall make butter or sell milk is often taken up by the farmer. I say to you that any milk producing section is gradually growing poorer and poorer. In any milk selling section in the United States, no matter where you find it, those farms are growing less and less productive. In any butter-making section in the United States, no matter where you find it, those farms are growing better and better. The farmers in Elgin, Ill., have become rich. I knew those farmers intimately in 1870, and in twenty years the productive power of those farms has increased over seventy per cent. Go into Orange or Delaware county, N. Y., or into Southwick county, N. J., from which counties milk has been constantly shipped, and you will find that the productive capacity of those farms has steadily grown less. It is a question whether the profit is all to be had in the money of to-day. As the gentleman said this afternoon, there is a spending that saves, and a saving that spends. There is an economy in spending, and an economy in saving; and there is a haste that makes waste.

Mr. Ellis spoke about the need of more cows and more faith. I will give you a little object lesson. The county of Jefferson in which I live is composed of sixteen townships, and is twenty-four square miles in area. The cow population is 28,000. The cows of that county earned in cash last year, in the butter and cheese which they produced and in the value of the skimmed milk, $2,100,000. Now I tell you, gentlemen, that when you drop two millions of dollars into a county only twenty-four miles square,it makes a wonderful difference with the prosperity of those people. And that is not the only income of the county. There was considerable beef and lots of pork sold, but I will put that into the value of the skimmed milk. There was also a good deal of grain and hay sold. The general farm products of that county I think would be easily said to amount to between two and three quarters and three millions of dollars. Not alone that, but it is a strong manufacturing county. My own little town of three thousand inhabitants is a very heavy manufacturing center. This money which the farmers produce, coming in there, stocks the banks. The banks of Jefferson county reported to me last fall (and you know that we have been having a hard time) a million and a quarter on deposit from the dairy farmers alone. Now that tells the story, as to whether dairying has been prosperous to such a community, doesn't it? In the little area of eight by ten miles,—and the Hoard creamery receives only about one-third of the milk product,—we pay out $340,000 a year to those farmers for milk. Multiply that by three and you have pretty nearly the amount that is paid out in that section. Among the 800 patrons that we have, there are 250 silos. I come to you endued and endowed with notions. You may say, "Hoard, they don't fit us here." Well, what they earn out there would fit you mighty well. I just want you people in Maine to be just as prosperous as those people. I tell you that this man who is sectional and provincial had better go over to Hawaii or some other island of the sea. The old darkey said to his master, "Massa, don't you wish we were living on an island where there wasn't anybody else, and we were just keeping tavern?" Mr. Ellis was right, he struck the key note, and I hope you will think of it.

Mr. Meader spoke of selling butter. Let me give you just a little hint there. Sell your butter always in a butter market, if it makes you smart like a raw sore at first. Sell it in a butter market, and get the education which the market will give you. Do not sell it in a country town where the store-keeper doesn't dare tell Mrs. Jones that her butter isn't any better than Mrs. Thompson's. Ship your butter by express to Portland or Boston. Send it to a commission man, if you can find one that is honest, and I think they are to be found. I know that I have a good business with Boston, away out in Wisconsin. I have a surplus of butter, and send it to Boston, New York, Philadelphia, Baltimore, and New Orleans. I must trust men, and men deal with me fairly. When I think they do not I get after them and must have a judgment. Men treat us very much in proportion to what we know, not in proportion to what they know. So ship your butter by express to Boston or some other market, on commission, and let the butter market judge it sharply, just as the man comes here to judge it. Then the answer will come back to you, your butter is this way or that way. You will not stand in that white light long, but you will shift around. While you are selling your butter in these country towns you are simply measuring yourself by yourself, and that is no square edge.

Now, in regard to this matter of over-production. Let me suggest to you that the first thing to consider in this whole question is to get at the end of the string that lies on your farm, as I said to you to-day. Study the problem of reducing the cost of production. It would startle me if I discovered that my butter was costing twenty cents a pound. I would begin to figure to find out whether it was the cows, or the feed, or my management. Because that leaves too small a margin.

Let me make another suggestion to private butter-makers. You have seen this fine exhibition of butter, and some of it was beautiful. Let me suggest that you buy a sample package of some of this butter, and take it home with you, if it costs you a half a dollar a pound, and begin to study that butter. Sacrifice a five pound package of butter in a study as to its character and taste. Taste it until the memory of that flavor is on your mind, and then whenever you make any butter remember that flavor and square your butter by that.

From 1875 to 1885 there was not a creamery in Jefferson county. The first creamery was built by Mr. Mansfield. There was no creamery, but the butter was shipped on commission to Chicago and elsewhere. How did the farmers get into the way of doing that? I got some men up from Chicago and called a meeting of the dairymen, and got those men to tell us what to do from the market standpoint. "What does the market demand of me as a butter-maker?" was the title of an address that was given to those dairymen. We have had no talk at all here to-day from the judge of butter. We ought to have had a good, sharp, clean lecture, telling us of the deficiencies in the butter, and telling us what the Boston market demands in the making of butter, and the packing, etc. Now I went to work on these men and got them to ship their butter. There were but two men who made butter and sold it on its merits. In eight years time I had 1500 men making butter and sending it to the market. I used to go into their homes and take off my coat and make butter with the wives,and the men would come around as farmers are pretty jealous and wont have an old fellow making butter with their wives, and this would make it more binding. I would say, "I want you to brace up on this thing." I spent my time in that way, and my wife scolded and said, "If you would let these confounded farmers alone and attend to your business we would be better off." It has come around all right since. It was bread cast on the waters. My farmer friends have been faithful to me. It moistens my eyes when I think of it to-day. The man who says that the farmer is an ungrateful man is very much mistaken. Too often he is treated ungratefully, but he is just like any other man. Be faithful to him,—let him get fractious all he wants to, and by and by pull him in,—and see if he will not be faithful to you.

Did I tell you the story of my old friend, Karl Striegel? That is one of the best little object lessons that I can give you. About sixteen years ago there came into my office one day a thick set, sturdy little Dutchman by the name of Karl Striegel. He sat down and looked right at me for as much as a minute. Thinks I, what is on your mind? By and by he broke out, "Mr. Hoard, I like to speak mit you." "What is it, Karl?" "Well, I like to speak mit you on de dairy business. You come out to our school house and I hear you talk, and dat make me some trouble in my mind. I do not know if I get dat ting right or not. I want to tell you on myself." "Go ahead, Karl." "I got me sixty acres of land, I got me nine cows," (and he had not talked two minutes before I saw a very earnest soul right before me, looking right at me, speaking frankly and sincerely, and it put me instantly on the square by him) "I got me frau and I got me six shildren,—sometimes I tink dat vas too many shildren,—and I got me mortgage; and dat mortgage, dat stay dere. I have worked in de morning and in de day time and in de night and I do not get dat mortgage off, it stay dere, hang on me all de time, stick so close to me. De frau, she make de butter, and I go up to Mr. White—he is de grocery man—and he schmell of dat butter and he say, 'dat butter shtink! It be not good!' And maybe he give me some little tings for dat butter. Now I cannot make de butter, no! And I want to talk mit you on de dairy business. I got me no money. You tell me I must do dat ting or de oder ting, and I got me no money. How shall a man do everyting if he got no money?" Well, I looked into the situation with Karl, and I said to myself, now here is an earnest heart. That man just wants somebody to lift somehow,—to help him to see, and it is my duty to get right down where Karl Striegel is, and I will see what I can do. This appeal to me had awakened in me in a moment an unwonted interest. So I thought a little and then I said, "Karl, you say you have got no money, and the difficulty with you is you are not making butter for the butter market; you are just making stuff. Now you might as well sell goose feathers in a cast iron market as to make butter and sell it in the way you do. You set the milk in the pans in the pantry, and the wife cooks sour-krout,and washes on Monday,and everything gets into the butter. Now, look here, Karl! You must make a start in another direction. You must commence." "Vell, I got me no money, how shall I commence?" "But, Karl, haven't you got money enough to buy two kerosene barrels?" "Two kerosene barrels! Mein Gott, vat vill I do mit kerosene barrels? Dey make more shtink." That idea seemed to be sticking in his mind all the time,—the butter did not smell right, and the grocery man had turned up his nose. "Well" I said, "Look here! You have a good well and you have a good windmill; I know that you have a good, cold well of water for I have drank from it. Now let us see what we can do. We will buy two kerosene barrels, and stuff them full of straw and burn out the kerosene, and that will make two tanks to set the cans in. If you have money enough to buy $5.00 worth of lumber you can build a dairy house out of doors, and enclose that dairy. Now go down to the tin shop before you go home and order, for the nine cows, about twelve or fourteen cans,—long shotgun cans. They will cost you not more than sixty or seventy cents apiece. Then you go home and set the old pump going, and put the cans in those two barrels, fixing them so that the water will run from one to the other and into the trough to water the cattle." (In Wisconsin we water the cattle in that way a great deal, pumping the water with wheels into a long trough that runs out thirty or forty feet into the pasture.) "Let the windmill keep the water running, and that will keep the tank cold." "All right," he says, "I will do what you say." "Now you bring me word when you have about eighty pounds of cream,and I will come out and churn it,and we will see what we can do to make a start in a better direction." I told him to get another large can to put into the cold water,in which to keep the cream. He sent me word when he had a can full of cream, and I took a little rectangular churn and loaded it into my wagon and started off. I was musing to myself what I was doing with that little Dutchman. When I got down there the frau looked at me very suspiciously. She said to Karl, "Dat Yankee is a humbug! You look you out." Karl said, "No, I tink dat vas all right." So I started in and churned the cream, and I had about twenty pounds. I had taken a package with me and I packed the butter into it nicely, and the children gathered around, and the wife, to watch me. I fixed it all right and took the package and started home. Karl said, "Vat are you going to do?" I said, "Karl, I am going to send the butter to a commission man in Chicago." "Mein Gott!

I never see dat butter again!" "Why, yes, Karl, you will see the money for it. Where do you think Mr. White sends his butter? It is all a matter of business. You want to know business, and go on and do business." So I got hm stirred up, and took that little package and went to my own home and wrote this letter to a commission man. "I have sent you a package, by express, of twenty pounds of butter. I want you to take that butter and sell it,—sell it on its merits, and send me your check and an account of sales. This butter is from my little German friend, Karl Striegel, and it is the first fruits of righteousness from him." In about three days back came the account sales and the check. Butter was then selling in the stores, as Karl was selling it, at about fourteen cents a pound. This commission man sent me back my account sales at twenty-six cents. I took that little check and that little account of sales, (like the pack which Whittier says is "Light as a snow flake" I felt as though it weighed a ton) and went down to see that little Dutchman. I knew the quality of the man and knew that it was seed sown on good ground. I went into the house and called him in. He says, "You hear about dat butter?" "Oh, yes!" Then I held him up this check and this account of sales and said, "Your butter sold for twenty-six cents per pound, and there is the commission and the express taken out, and there is about twenty-two cents for you." He stood there a minute, and it seemed as though he could see the clouds part and the rift come in and the light shine upon him. He could see the beginning of the lifting of that mortgage which had become a nightmare to him. He caught his wife by the waist, and waltzing around the room said, "Mein Gott, dat is no humbug!" That man went right on, there was no stopping him, and to-day he is worth $40,000, with 250 acres of land and a dairy of about seventy cows. He said to me one thing, "I cannot write me any, I know not how, and what shall I do?" I said, "Karl, you have some children growing up. Here is a little girl, she can do your writing for you, and when you get in a swamp anywhere come to me and I will try to straigthen you out." Once in a while I will get a little package of butter addressed to me to be left at my printing office, and on it will be inscribed something like this,—"To my good friend, who showed me how."

My good friends, I have had some honors in this life, I have had honors more than I deserved showered on me, but I would rather take that little Dutchman by the hand and show him how he could lift that mortgage than to be Governor of Wisconsin forty times. There is more dignity in it, there is more character in it, there is more future in it. This work of taking hold and knitting up this ravelled sleeve, and showing others how they can better themselves, is not merely money in the pocket. The American farm home is going to decay. The cities are being built up, the boys are fleeing to them. It is to avoid such things as these that we need a knowledge of means by which to bring larger and better prosperity, that the old God-blessed American farm home shall once more dot the surface of this country, and once more be the hope of American citizenship.

On motion of Mr. Stetson voted, that the thanks of the Board be tendered to the owners of this hall for its use during the meeting.

On motion of Mr. Wheeler voted, that the thanks of the Board be tendered to the citizens of Norway for their hospitality and kind attendance upon these meetings, and to the hotels for reduced rates.

On motion of Mr. McKeen voted, that the thanks of the Board be tendered to the railroads and express companies of the State for reduced rates.

The chairman on behalf of the conference extended thanks to Mr. Briggs and the choir of the Norway Grange, who had volunteered to furnish music for the occasion.

THAT BOY,--WHAT SHALL WE DO WITH HIM?

Lecture Delivered at Fryeburg, Me., by Dr. A. W. HARRIS, Wednesday, August 7, 1895.

LADIES AND GENTLEMEN: Your attention has been called to the fact that you have to address this grange meeting to-day, two college presidents. It may be remarkable,—I think it is also somewhat significant and a matter for congratulation, that the grange, at least in the State of Maine, is pre-eminently an educational association; and that fact is quite in keeping with the request that Secretary McKeen made to me that I should speak upon the new education, whatever that may be. Doubtless many of you will suppose that that is intimately related to the fact that I represent a technical institution. I trust, however, that you will find before I have finished my discourse this afternoon that the new education is not in any sense a different education,other than that it represents some new things in education, and that President Chase and myself are not so very far apart in our ideas of what education ought to produce. I feel, in the presence of such an audience as this, that I ought to make some apology for making an educational speech upon such a topic,—"That Boy, What Shall We Do With Him?" It is one of the remarkable things about the new education that the boy does not stand alone as the only subject for education. That girl is just as important as the boy, but perhaps I may be allowed to narrow my speech slightly, and confine my principal attention to the boy. My wife has already said that she never had any fear of my falling in love with girls if there were a boy about. The boy has always been to me the most interesting creature that I have found. I have always found him the most ready to respond to what I could do, at any rate, to arouse his ambitions, and arouse a desire for something better and truer. I used to find when I was abroad that in some way or other the boys always appealed to me more largely than the girls. I think it is true, even aside from my prejudice, that on the continent of Europe the little boys are handsomer than the little girls. It would be a dangerous thing to say in this country, if it were true, and I do not believe it is, but surely it seems to me that the boys, especially in Italy and Switzerland, are much more attractive than the girls. And then a boy is a wholesome thing. I believe we often have a false idea of a boy's morals, in school. I believe a boy's morals are just as good as a girl's, and I think it is true that a college community is one of the noblest and most wholesome communities to be found on the face of the earth. Never in my experience have I found so much unselfishness, so much devotion to what is good, and true, and right; never anywhere have I found so much true democracy, as in a college. The place is nowhere to be found where a man is valued so truly and accurately for what he is worth, and I believe this is true, probably, in every college in the land. I think it is true, too, even after a boy ceases to be a boy, that we very often underestimate the amount of true religion that the young man possesses. Perhaps he is not quite so regular in attending religious services as his sister,—he does not give exactly the same expression to his religious aspirations, but they are there just as truly as they are in the girl, if we only know how to call them out. Have you never noticed how, when a young man begins to feel the weight of responsibility on his shoulders, to your surprise you have found that there is within him a steadiness and an earnestness for which you never gave him credit? Even some young man upon whom you have been looking with eyes of disapproval because he seemed to be frivolous, has,under the burden of responsibility, proved to be a man dead in earnest. Notice the relation of a young man, seemingly without any great interest in religion, towards his own little children, and you will find that through the whole human race, men as well as women, a religious purpose and a religious foundation runs.

I think, too, that boys ought to be sympathized with. It is the little boy that we keep out of meetings; it is the commonest thing to say that boys are not to be admitted without their parents or older persons. I believe we are mistaken in the small boy. He misbehaves, but I am not sure that he misbehaves very much more than the girl does, especially when she is a little older and reaches the giggling stage. I shall never forget the indignation I felt when at an illustrated lecture I saw a row of small boys being driven out of a front seat to make room for some women. I protested, the boys kept the seat, and the women took the seats left for those who came late. I believe we would do well if we made our hearts a little more tender towards the little boy, as well as the bigger boy; but it is the bigger boy that I want to talk about. He is a great care. No one who has not been a parent can understand what a care a boy is; how, through long years, day and night, he is a burden upon the heart of the parent; how the anxiety for his future, his well-being and his well-doing, is ever present with the parent, whose greatest treasure is the son whose future may make or mar the happiness of those who have hung upon him throughout his whole life. A successful boy is the best investment a parent ever had. I do not believe there is any father, or any mother, who regretted the care, trouble, and cost that have been put into a boy who makes a success in life. I was very much struck by an incident that occurred as I sat in the office of Secretary Rusk, who was familiarly called

"Uncle Jerry." He was secretary of agriculture, having been, several years before, a member of Congress. Among his assistants was a man of the name of Myrick, an ornithologist, certainly one of the foremost scientific ornithologists in the world; and one day the ornithologist brought in his father, who, as it happened, had been a member of Congress with Secretary Rusk. The secretary was very much surprised and accosted the father in this way;—"How in the world did you ever come to have such a smart son as this fellow?" After he left some one said,—"Were you not afraid to make such a remark as this to Mr. Myrick?" "Oh! no" he said, "There never was a man yet who would be insulted if told that his son was a greater man than he was," and I believe that this is true.

And what a difference there is in boys! What a difference in body,—but that is a familiar one; what a difference in looks and in thought. Take two boys, or two men, as you go down the street, and notice the difference in their faces alone. One has a sodden, heavy face, containing very little of intelligence. There is nothing in it that responds to your own affections. And the next one that you meet has a clean, bright face, the face you want to see on your own son. And what is the cause of this difference? Almost entirely, education. I say almost entirely, for I cannot stop to guard my statement, and it is very nearly correct that the difference between a cultured and an uncultured face is education, To be sure some of that education is an education that is begun before the boy is born,—we inherit a large part of our tendencies towards what is good and true and beautiful and noble,—and then a great part of it is put into us by contact with men and women; and thus the greater part of education is made up.

About the school education I shall have very little to say, because I imagine there is very little difference of opinion. If a man would gain from his son the return which he wants for the investment, there can be no doubt, I think, in any mind of intelligence, that a common school education must be laid as the basis for success in every walk of life. Every boy, and every girl as well, ought to have the advantage of the best common schools, and in my opinion the time has now arrived when practically every boy ought to have the advantage of a high school education.

You remember what President Elliot said in regard to education. Somebody had remarked that it did not pay to educate his boy in college, and he said it never paid to put $2,000 worth of education into a $500 boy. There is a great deal of truth in that statement, but at the same time there is great danger that the statement will be falsely taken. I believe every boy will pay good returns on a high school education in these days, when every line of business involves a knowledge of science, and requires careful and true and correct thinking. It is worth while, and more than that, I am prepared to say that usually it is necessary, to see that a boy who has to make a living out of the world should have a high school education. And I am interested in another kind of education. You cannot have too much education if it only be of the right kind, and there are a good many kinds. Not the greatest part of an education, of course, comes from the school. There is a tremendous education that comes from the home, and that the parents are directly responsible for; and then there is an education that comes from travel and contact with people. I believe that every man who can afford it ought to see to it that his boys and girls have not only the education they get in their own home, not only the education they get in the high school, but that they have the education they get by contact with people entirely out of their circumstances, outside of the state if possible, and if possible farther away, for a little time at least. One of the amusing things is that when a boy begins to travel he carries with him such a provincial feeling. I had a brother-in-law come to visit me this summer, a bright boy from Philadelphia. He has been taught to think that Philadelphia is the greatest city on the face of the earth, and has the very erroneous idea that out of Philadelphia there is not much; and he had, too, the notion that the people in the State of Maine are backwoodsmen, and I was very much amused at his criticisms, which showed that the boy as yet was no bigger than the city of Philadelphia. I want my boy to be not only as big as Philadelphia, not only as big as Maine, but just as big as it is possible to make him. And I should send him over the face of the country,—if I could, over the face of the world,—so that his sympathies and his judgment shall be strong enough to know a man wherever he finds him, to know a good idea wherever it comes from, to know a noble thought whoever may be its originator. But the kind of education which I want to talk about chiefly is not an education which I have yet described, but what we ordinarily call a college education. That is a broad and rather indefinite term, because colleges are so broad and so indefinite; but if you please I will define it in this way,—the education beyond a high school, whatever it may be. There are certain things upon which we shall be agreed in regard to college education. First of all, its practical value. There are a great many people who measure things in the world by dollars and cents, and they are not so far wrong as some would think, for if you can determine what a man is worth in dollars and cents, you have really got the most useful measure of his value to the world, commercially, at any rate. The man who is most useful is the man who gets the most income, not the doctor, the lawyer, or priest. There was a time when the stateman, and farther back the soldier, got the great things of the world, but this is not so to-day, and I think the change indicates that the day of the soldier, the day of the lawyer, and the day of the professional man has gone, and the day of the business man, the man of affairs, has come. It is worth while to stop and think whenever you find that certain things produce great financial results. Somebody has said, I know not how correctly, that although the college graduates of the United States make up only about three per cent. they hold about seventy-five per cent. of the best places in the world. This statement may need qualifying, but I am inclined to think it is probably not far from corect. You will find indications, if you look about you. For instance, take the legislature of your own state; one of the remarkable things about it is that there were so few college bred men in it, and another remarkable thing is that the few who were there held so many important positions. The Speaker of the House, the Chairmen of the more important committees, the President of the House, all belonged to the small proportion who had had a college training, and that must indicate something. Notice your own delegation to Congress; and while the politicians of the state as a rule are not college bred men, very few of the non college bred men get to Congress. Sometimes we think it takes sharp politics to get into power, but sharp politics and a good education, in the State of Maine at any rate, go together.

I was very much struck by an illustration of the commercial value of education at our last commencement. One of the classes that graduated not many years ago (as the college has only had fourteen commencements there are no very old classes) had every member present, and they struck an average of their incomes, and they found that the average income was over $2500. Now when we remember that the average income of the State of Maine is probably less than $400, you will see what a wonderful commercial value a colege education had to that class. Many years ago a man who was an authority in educational matters in this country estimated that a college education ought to be equivalent to a $10,000 endowment to a boy; and if that was true, then I am inclined to think that we should say its commercial value ought to be estimated about $20,000. These are only estimates, but I think they indicate the fact, to which we agree.

And then if I had a boy whom I might send to college, even at a good deal of expense, I think I would send him, even if the commercial consideration did not come in at all, provided I was sure that he would get out of his education merely the satisfaction which having an education has been to me. I have been acquainted recently with a learned man, a man of broad education, but not a man of college training, though with a better education than many a college graduate, and I have been struck at times with the amount of discomfort he has because his own estimate of himself is too low. He really knows as much as most men who go through college, but he does not know that fact; and there is an immense amount of satisfaction which comes from knowing where you stand, and being able to compare yourself truly and accurately with your fellow men. One of the things that surprised me most when I went to Germany to study was to find that the difference between American and German institutions was nothing like so great as I had imagined. I had supposed that I was to find teachers and professors who would tell me such things as I had never dreamed of, and nobody in this country had ever dreamed of; and it was of immense value to me simply to find out that even in a German university they do not know very much more than in an American university. I think it is true, as a rule, that an American student will find more benefit in an American universtiy than, at least in a short course, in a German institution. We have tremendously over-estimated the advantages of foreign institutions, and greatly under-estimated the advantages possessed by our own institutions.

There is one other statement which I shall make that I do not expect most people will agree with,—and that is that the higher education is not only becoming a paying investment, but a necessity for the best success. There are a great many people, I know, who will not agree with that. I remember that my own father had a notion that a college education was a very good thing for a boy if you were going to make a minister, or a doctor, or a lawyer of him, but if you were going to make a business man of him he probably would make a failure if you gave him too much education. He had a notion that a man with a college education was not fitted for practical affairs. While he might be fitted for theology or medicine or law, when you got down to hard work in making a living, the education would be of no avail. But we are getting over that notion, and it is significant that even to-day the majority of the business men are college graduates themselves,or are sending their boys to college. And it is worth while to remember, even in business, what Oliver Wendell Holmes said about a self-made man. He said, "You are very much struck by a self-made man, and it is well you should be; but as a rule the remarkable thing is, not that he is well made, for he is not, but that he is made at all." And I think that if you will look about among your own acquaintances, among whom you will find that nineteen-twentieths of the men are self-made, you will see that the men whom you quote as shining examples are really exceptions, and not the rule. The schools and the colleges do furnish the best men for business, as well as for learned professions.

A few days ago I took a ride with a man who is very old but still in vigorous health, and he told me his impressions as he saw the rails laid for the second railroad in the United States. He had heard of railroads before, in his childish days, and in his geography he had read descriptions of a railroad and of a steamboat. He told me the exact words of the geography in describing a railroad. There were "Longitudinal rails laid upon cross sections," etc. I cannot quote the whole of it, but the remarkable thing is that a time should ever have been in the life of a living man when it was necessary to describe a railroad to school children. Note the wonderful development that has occurred in the life of that one man.

I will call your attention to just one or two other developments that are perhaps still more striking. When I went to college, and I am by no means an old man, there was not a telephone in the United States that I had ever heard of; I believe there were only two or three in existence, and the inventors of those had not been aware of the fact that they had discovered anything of any commercial value. The first electric light that I ever saw was at the Centennial. There was a little booth devoted to the Edison exhibit. I had never heard of Mr. Edison at that time, but the thing that struck me was the fact that up over the door of the booth were letters spelling the name, Edison, made out of little lights. Anybody might turn on the lights and turn them off again, and I rather enjoyed playing with them for a while. That was my first experience with the electric light. Since that time every development of importance in commercial electricity, except the first display of the electric light, has been made. And then, too, it is a familiar fact that almost every line of business comes to require more and more a knowledge of the sciences; and that is true just as largely, even more largely, of agriculture, than it is of almost any other line of business. I was very much interested last night in reading a report of the Connecticut Experiment Station in which were detailed two facts which illustrate as well as any others how in all agricultural matters science is becoming more and more important. The elm trees in the city of New Haven have been attacked by a new insect, so far as the members of the Station know, and they have been giving remedies for the control and suppression of the attack; and it was stated that unless these remedies were promptly applied, the famous elms of New Haven must be sacrificed. Then they discovered the San Jose Scale. I have never seen that scale, and it never had been seen in the state of Connecticut until one year ago, and yet they saved the whole fruitage of the state. I could go on for an hour telling of examples of this sort. Every year and every week there are new opportunities for the application of science in agriculture, and wonderful opportunities for the application of science to many other lines of business, but I think I have said enough to indicate the fact that it is almost, if not quite, a necessity, if a man is to have the highest success in life, that he should be acquainted with at least the principles that underlie the natural sciences, and that he should have such training as will enable him to think clearly and make proper application of that knowledge. I think it is not only a useful and a pleasant thing for a boy to go to college, but it is almost a necessity for him to go there if he is going to make the kind of success that you want your boy to make.

Then the question will arise, what kind of a college are you going to send him to? A few years ago that question could not have been asked, unless you meant whether the college was poor or rich, or referred to the grade or the religious denomination, because all colleges were of the same kind. That is, they were all the old fashioned college. Their curriculum was made up of the two ancient languages and mathematics, with a certain amount of philosophy; and I want to say that it was a good curriculum, and if I should live to be as old Methuselah I should never get away from my enthusiasm for the education which I had; and if that suits your boy you ought to send him to that kind of a college. For instance,—we had a boy in our last freshman class who came to Orono intending to be a civil engineer, but he changed his plans and decided to become a minister. He came to me and asked whether I thought the training we gave would fit him to be a minister. I told him I felt very sure that the study of the morality that there is in science would not do a minister any harm, but I thought a boy who would be a minister should have a classical education; and as a result he left the institution with which I am connected and this year is to enter another and take the old fashioned, or classical, course. There are some boys who ought to take that course, and the most important thing to be considered when you select a college for a boy is, not the college, but the boy. Never allow your loyalty for any institution to cause you to send your boy to any other college than that which best suits him and his needs. The boy should have the first consideration and the college the last. The college is merely created to serve him and give him what he needs.

Now I really am making a plea for the boy; otherwise I should not have anything to say on the topic to which I now propose to address myself. I have found that most of the men and women who write me in regard to sending boys to college ask particularly about the cost, and it does cost a great deal of money to educate a boy. Indeed I think it is fair to say that there is nothing, unless it is an idea, that costs so much in this country as education, and if you have any idea of getting any good education for a boy or girl without paying a good deal for it, you may just as well give up that notion. A good education costs a good round sum, and there is in that statement, I think, an important lesson for the whole state. If you want good schools you must pay good prices. There is no economy in simply cutting down the wages of your teachers; and for my part I believe that the time has come when the state has no right to allow within its borders any public school which is poorer than the very best. And if it takes the greatest part of the treasury of the state to keep the schools where they ought to be, it is the duty of the state to pay the bills, and it is wisdom on the part of the state, for there is nothing that pays any better than good schools. Not long ago I rode through Waterville with a friend who has been interested in the education of that city. We went through the French settlement and my friend said, "If you had gone through this place ten years ago you would not know it now. The houses were the most miserable and there seemed to be no desire to keep them in any sort of decent style." I was surprised, because the quarter to-day is entirely respectable, and a credit to the town. And he made this statement;—"The improvement is due to the public schools of the town. The parents have got their notions of decent living from the children who brought them from the schools." And I suppose it has paid Waterville ten times over every year to educate the children of those French men and women who are to make so large a part of the success of the town. Education is expensive, and what is unfortunate is that most of the boys who seem to want an education are not able to pay the bills. I suppose about half the boys who write to me want to earn a part of the expenses when they are going through college. You know when the State college was started the idea was prevalent that the boys could work on the farm which is connected with the institution, and so get some money to pay the bills. It is a little surprising now, that anybody thought that could be done. It is almost an axiom that no man can do two things at the same time, and if a boy has to earn his way through college, it takes so much of his energy and time to make his bare living that he has not the energy and time needed for getting his education. One man said to me last winter that it was a good thing for a boy to work his way through college, and that a boy or a college did better when they had to pinch their way along. I pretty nearly made him say that he wished Bowdoin had not so much money as it has; but when he got to that statement he recognized the fallacy of his theory. It is a good thing for a boy to know what an education costs, and if there is no other way to get it, it is a good thing for him to work his way. This is certainly better than not to have the education, but as a rule you must not expect a boy to both support himself and get an education at the same time. Let him try it if it is necessary, though, by all means, and it is very remarkable how many boys there are who want help, and how few of them can get it.

The institution from which I came needs nothing more than it needs funds to help boys to put themselves through the college. I do not mean gifts, but simply loans that will enable them to get along until the time of earning comes. Very few of us appreciate what a college education costs. I made an estimate of what it costs to put a boy through the State college on the supposition that his own expenses would be $200 a year, and I found the cost was not far from $3,000, and there are many institutions whose annual cost is almost as much as that. Out of that $3,000 the State pays five-sevenths or a little more; in other words, a boy who has $200 to spend in a year, may go to Orono and get an education which actually costs about $700, the $500 being supplied in the form of endowments or grants from the national or state governments, or the interest upon endowments. But the difficulty with the boy is to get the $200, and I want to lay stress on the fact that though the cost is very great it should be regarded by the boy as very small in comparison with what is gained. In Germany the law used to require every able-bodied young man to give three years of military service to the State, and during those three years he was put into drill and carefully drilled for service in the army if he might be needed, and the young men regarded it as a terrible hardship, and a great many of the older men thought it was an unbearable burden placed upon the state, to take out of the productive forces of the country three years of every young man's life, requiring that time to be given without recompense to service for the state. In the same way we require all of those young men who are to give services that necessitate college preparation to spend four years in college. And while it is no small item for a boy to take four years out of his life from the time he is sixteen or seventeen and devote them to preparing for his life work, yet the boy really has made a great contribution, and I think that justifies the expenditure of the nation and state. And attention ought to be called to the fact that these four years, while they are the most valuable years that the boy has for the purpose of education, are the least valuable for purposes of mere money making. You take a boy at the age of sixteen and turn him over to make his living, and if he makes his clothes and his board for the first four years he does very well. At the same time he can learn in the schools in those four years what he could not learn in ten after he has reached fifty years, and what he could not learn in twice four years after he has reached thirty-five. Therefore it is good economy for a boy to devote those four years, not to money making, but to preparation for life, and I believe it is true that most college students, ten years from the time they enter college, have actually earned more money than they would have earned if they had been during the whole ten years engaged in productive enterprises. They are earning nothing the first four years, and very little the first year after leaving college, but their earning capacity increases very rapidly after the course is over, so that I believe it pays a boy in dollars and cents to get the very best education he can.

Then there are certain risks that appeal to every parent in sending a boy to college. If you want to make a merchant of your boy you put him into a store directly; you have him in the town where you are, and you know all about him, or at least you think you do, though very often you fail of knowing everything about him. At any rate he is near you and you feel safe, and you have heard wonderful tales of the immorality of a college community, and you have heard terrible tales about hazing, and you are afraid your boy will be hurt. You can never talk to parents about a college education without touching upon these two topics. In regard to the risk, I believe it has been enormously over-estimated. Every boy runs a risk, and a great risk, when he reaches the age where he begins to think and act for himself. I think as a rule he runs a smaller risk in a college community than he does at home. Parents must recognize the fact that after a certain period is passed parents have very little to do with the children; they must make their own way in the world and it cannot be made for them. The President of the Board of Education of the state of Michigan and President of the Board of Trustees of the University of Michigan sent a boy to the University, and felt very uneasy about the boy,--I judge from all accounts with good reason. During the boy's sophomore year there occurred a rebellion of some sort, and two or three of the boys were suspended, and the class undertook to discipline the faculty by refusing to attend any recitation. They signed a paper saying that until those students were re-instated the class would not attend recitations. The president telegraphed to the parents, and they told the boys to take their names off the paper, with the exception of the President of the Board of Trustees. He sent no word to his boy at all, but telegraphed to the president, "Stand by your guns." The boy was suspended and when he came home his father said to him,—"Do not make any complaints or any explanation; you have made a martry of yourself, and, if you are a man, you must bear your martyrdom without any complaints. Take your books and go to work and do the best you can." But the boy said, "There is one thing I want to say,—I am glad you did not make me take my name off that paper. I would rather take the punishment than to have done that." Your boy and girl must learn to fight their own battles in life, and by getting some knocks and hard treatment; and if you are wise you will let them bear the knocks and not try to shield them. You must expect your boy is going to run some risks. Select a safe place for him as far as you can, but understand that there is no power in any college that can entirely protect your boy from temptations, and you must trust him to carry himself through. And as a rule they do it; almost every boy that goes to college turns out well. There are exceptions and we hear of them frequently, but the rule is a good result and not a bad one.

In regard to hazing I am not going to say very much. I understood it was once said that hazing had been abolished in the colleges of the State of Maine, and in one sense of the term it has, but it still exists, probably in every college in the State of Maine, if you define it in a little different way. Last winter I spent quite a little time in Augusta. The State college is supported partly by State appropriations, and it is one of the unpleasant duties of the president to look after the appropriations; and as bad luck would have it I was about ten weeks in Augusta, and became pretty well acquainted with the ways of the legislators; and I suppose we will agree that legislators ought to represent the straightest class. Most of them lived at the Augusta House, and I am prepared to say that there was more hazing of an objectionable sort in the Augusta House last winter than at the State college. And most of the hazing that occurs in the colleges of the State is simply of the same kind that you will find in the Augusta House every winter. Most of it is good natured,—once in a while the good nature is lost, but those things cannot be prevented You cannot put any large number of young men together without having some practical jokes perpetrated, but I think any boy is safe in any Maine college. There is certainly no intention of hurting the boy, there is very little intention of being unkind, but you must remember that boys may think jokes things which their mothers would not, and I do not know but the boys are very good judges after all.

I want to make just one appeal to the mothers of the boys. I was very much struck by the remarks made by one of our students. From some things that I knew about him I was a little surprised that he came to college at all. He had been a machinist and was not prepared for college, but he had worked as he could in making his college preparation at nights, and finally he had given up his business for a year and had come to college. He was older than the students are usually when they enter college. I asked him why he came, and he said his mother was so anxious to have him come, and kept at him so continually, that he could not very well stay away. I believe that in a good many cases the ambition is not so much in the father's heart as in the mother's, and I am glad of this ambition on the part of the mother. No mother is a true mother who is not anxious to have her boy get the very best that is to be had. If you have a boy it is right, and your duty, that you should covet for him most earnestly the best gifts. It will cost a great deal of sacrifices, perhaps, in many families in Maine, to give a boy a college education, a training in the classics or mathematics that will fit him for the so called learned professions, or mathematics in its high form that shall fit him for some of the engineering branches, or in the wider ranges which shall fit him for general business, whether it be agriculture or commerce. But I believe that the mother and father are safe in assuming all the sacrifices that need to be made in order to give a boy a college education. They are justified, and will be justified by the result. If it costs a great deal it is worth a great deal, and there is no investment in life which the parent can make which will be the cause of so much satisfaction and so much real profit as one that enables the son or the daughter to take a better stand in life, and do better and truer and nobler work for himself and for the world.

DANGERS TO HEALTH IN AND ABOUT OUR HOMES.

By Prof. GEORGE H. HAMLIN, State College, Orono.

Since it has been known that certain diseases of man and animals are caused by the presence, in the system, of certain low forms of life known in scientific classification as bacteria, but more popularly known as disease germs; and that certain forms of filth, or animal and vegetable waste, furnish a favorable medium for the preservation of the life and the distribution of these germs from one person to another, the celebrated text of John Wesley, "Cleanliness is next to Godliness" has come to have a new meaning, or at least its truth is beginning to be recognized.

Years of study and special investigation are necessary to enable one to go into the history and life characteristics of this peculiar order of plants, for such they are said to be, by those who have made their history a life study. For his knowledge of these germs, the sanitary engineer must accept the teachings of these men. Some of these, as I understand them, I will endeavor to state here in a somewhat popular manner. These plants are all microscopical and cannot be distinguished by the naked eye, and consequently were not generally known before the invention of the compound microscope. Many of these species cannot be identified by observing them at any particular stage of their life or growth, but their whole period of life must be carefully studied and followed through in order to identify any particular species.

While much actual knowledge has been acquired, much that is passed as knowledge concerning them is unsatisfactory and uncertain. It is known that their distribution is very general; and that while some of them are destroyers of human life, others are its preservers, and have very important work to perform in the economy of nature. Some of their useful work is to reduce dead organic matter to its elements. What we designate as rot, decay, and putrefactive action is only the work of certain species of these little plants; the odor of decomposing substances being due only to the gases formed in the process of their work. They also perform certain very important work upon the soil in preparing it for the support of higher forms of plant life. It is said by those who have given the matter much study, that, were it not for the services of these minute plants, in the course of time all the oxygen and carbon would become locked up in the dead bodies of animals and plants, and it would be impossible for any of the higher forms of life to exist on the earth. Take a piece of fresh meat and place it in pure air, air free from all germs, and it will not decay. This is why meat can be cured by drying, as it is in some parts of this country. The air is free from putrefactive germs.

There are certain harmless species of bacteria that probably assist in the processes of digestion; and probably many of those that are harmful and cause disease when taken into the system under favorable conditions, are killed by the acids of the stomach in its normal or natural condition in a well person.

However this may be, it is the part of wisdom to see to it that as few of these dangerous species as possible be taken into the stomach, in whatever condition it may be. If the germs are present, there are many ways in which they may enter the system, take lodgment, multiply, and produce their characteristic disease.

Disease germs increase and multiply in a very simple manner. When an individual attains its growth it immediately divides into two. "This multiplication, if nothing occurs to interfere with the most favorable conditions, produces an incredible number of these little beings in a very short time." It has been calculated that if a single individual divides into two in one hour, then both of these divide again at the end of another hour, and keep this up for twenty-four hours, and none die, the number will amount to more than sixteen millions. The temperature most favorable to rapid multiplication is between sixty and eighty degrees. When the temperature falls below sixty the rate of increase is reduced, and multiplication entirely ceases in the vicinity of the freezing point. The conditions most favorable to the life and growth of these organisms are moisture, warmth, darkness, and the presence of dead organic matter, dead animals, plants, etc. Sunlight is unfavorable to their growth, and hence living rooms should be well supplied with sunlight; and a damp, dirty cellar is a most unwholesome and dangerous neighbor.

In a well of water of temperature above sixty degrees and containing a large amount of organic matter, they may live and multiply. They will also live and thrive in brooks and rivers, in warm weather, if the conditions are favorable.

It is sometimes stated that the air we breathe is full of these germs and the water we drink is swarming with them; and that, consequently, it is useless to try to avoid them. But this is not so, for ordinary out-of-doors air is comparatively free from them, and pure water does not contain them. In a closed room, where the temperature is high and the ventilation is bad, and people live constantly, disease germs are more plentiful; and in water contaminated with decaying matter they likewise may be abundant. Some of these disease germs are readily killed when exposed to dry air at ordinary temperatures, while others have the power of forming what are called spores, or sacks, as it were, in which they do themselves up, and which have the power of preserving the life of the germ when exposed to unfavorable conditions of growth until, by chance or otherwise, the conditions become more favorable, when they immediately resume the functions of life and become as deadly as ever. Fortunately, however, but few of the disease germs have this power, and as all germs which cannot form spores die readily when exposed to dry air and sunlight, we readily see the great importance of such air in our surroundings.

Some of the more common of the diseases known to be caused by these germs are typhoid fever, consumption or tuberculosis, diphtheria, pneumonia, malaria, cholera, glanders and locked-jaw. Each of these diseases is produced by a specific germ, which, when introduced into the human system under favorable conditions, will produce the same disease every time. Each species of germ has its own peculiarities as to methods of transmission and lodgment in the human system. Some are distributed by means of the air and enter the system through the lungs, while others are distributed chiefly in water, milk, and the food we eat, and enter the system through the stomach and bowels. Some are distributed in both ways above mentioned, and others are found in the dirt and dust and enter the system through wounds and cuts. That terrible disease commonly called locked-jaw is not caused by the rusty nail or fork, but by the germ which it happens to contain, and which enters the blood in this way. If the specific germ is not on the nail or in the dust and dirt which enters the body in this way, no disease will occur. This germ is often introduced into the system through working in the dirt with freshly burned or cut hands. Carpenters sometimes take it into their system through fresh wounds in working in old dusty buildings.

Consumption or tuberculosis is a disease the germ of which enters the system both through the lungs, from the air we breathe, and through the stomach, by the germ being in the food we eat or in the water or milk we drink. As these germs are very general in their distribution and have so many ways of getting into the system, it is not surprising that this disease in some of its different forms affects about one-half of the whole human race and causes about one-seventh part of all the deaths. Our great danger from this disease comes from the fact that it is not generally considered to be a communicable disease, while in fact it is extremely infectious and communicable, not only from one person to another, but also from animals to persons.

Typhoid fever is another terrible destroyer of human life. It claims its thousands of victims yearly, and takes them largely from the ranks of the young and strong. Were the causes of this disease generally known and the precautions necessary to be taken to prevent its spread fully comprehended by all and properly attended to, it would be possible, almost, if not completely, to exterminate this dread disease from the human family. This same remark applies to many other diseases of this class. By careful attention to certain well known sanitary principles, a large proportion of the death and sickness caused by them may be prevented. In the case of tuberculosis and pneumonia, for instance, these germs are so generally distributed and have so many ways of entering the human system in spite of all the precautions we can take; we have enemies to human life which are extremely formidable,and will probably always remain so, yet by intelligent regard to a few well known facts much of their fatality can be prevented.

Figure (1) shows the bacillus of tuberculosis, or germ of consumption, magnified one thousand times, and figure (2) shows the cholera germ. These cuts were kindly given me by Queen & Co. of Philadelphia.

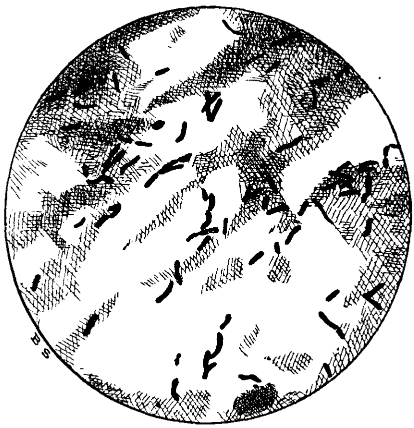


FIG. 1.

It is the object of this paper to point out some of the most glaring defects in the sanitary arrangements in and about our country homes. And my only excuse for attempting a description of the disease germ is that these defects which I shall point out may be readily comprehended.

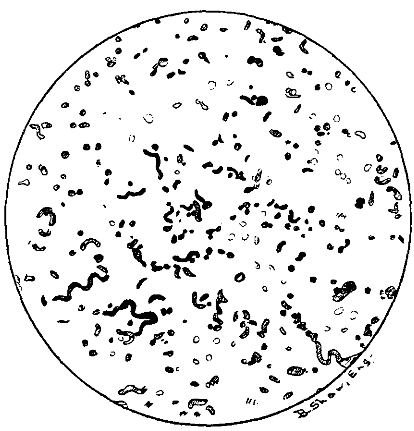


FIG. 2.

In the words of another, "Man is born to thrive, with pure air to breathe, pure water to drink, and pure soil to live upon. The impurities which tend to render air, water, and soil unfavorable for his best development are the products of his own life. The removal of the source of this impurity must be affected by his own act."

The country, and country homes, are coming more and more to be sought by the dwellers in the large cities, with the hope that from the pure air and pure water and the freedom from care, which they hope to find in them, they may regain some of their lost vitality. The large amount of money brought back into the country in this way cannot but be a great benefit to the farmer. Labor Commissioner Matthews tells us in his annual report that for the year 1893 it reached the enormous sum of ten millions of dollars in this State of Maine alone.

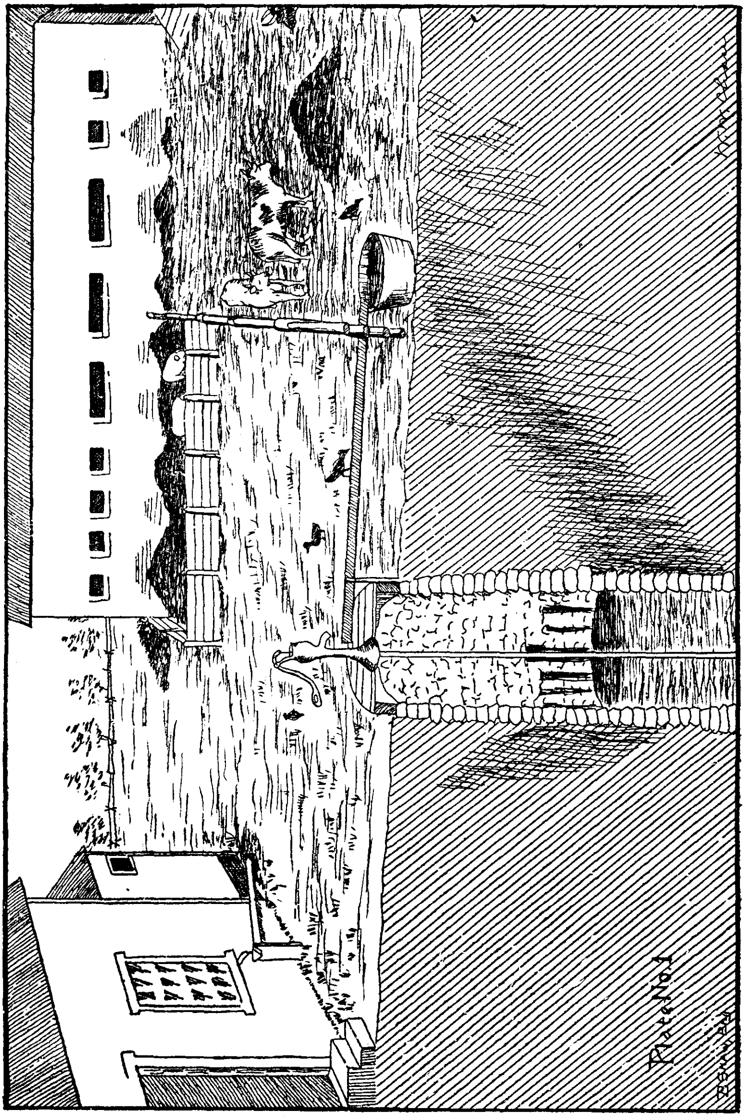
Every one who lives in the country is indirectly interested in the perpetuation of this custom, whether they participate directly in its benefits or not. And all should lend a hand towards making the country more healthful and attractive; first of all for the benefit and well-being of their own immediate families, but secondly for the good of those who are pleased to spend a part of their time and substance amongst us.

By the injudicious location of a well, or by the neglect of its proper care, many a visitor to the country for his health has gone back to the city with the germs of a deadly disease, which have not only destroyed his own life, but spread the death dealing germs broadcast among his neighbors.

Now that these things are coming to be better known, the owners of the country, if they do not wish to be deprived of a profitable business, must look more carefully to their surroundings. Farm buildings that are already located of course cannot be changed, the best must be made of their present location. But by a little forethought a bad location can often be avoided at no extra cost.

Site. In order that a site may be, in its natural state, a healthy one, it is necessary first of all that the conditions be such as to insure dry earth beneath and around the house. To this end the site should be chosen, if any choice is offered, with a view to the natural drainage of the soil, and in the construction and arrangement of the house and grounds care should be taken to promote rather than retard the subsoil drainage. Trees should not be allowed to completely shade the ground immediately around the house. If properly placed, they add not only to the beauty, but to the health of the locality; but when too near, especially on the sunny side, they not only keep the sunlight from the rooms, but make the whole house gloomy by the continual shade. Indeed, as frequently planted, trees never allow the walls and rooms to become dry, and so they promote the early decay of a wooden house. Sunlight is a great purifier which must not be shut out.

For natural drainage, a foundation of gravel is generally the very best. Sand is good if there is not a clay bed just below it. The side of a hill is usually to be preferred to the top or bottom, as the top is liable to be of a rocky formation and to have water held in place beneath the soil, while valleys are generally the seats of water



Cut showing how a well may take the drainage from house, outbuildings and barn.

courses. Where there is any doubt as to the nature of the soil, it is well to sink test pits in different parts of the building site, from which the character of the sub-strata may be judged. When it is impossible to change the position so as to avoid an unhealthy site, it becomes necessary to resort to artificial drainage, and if this is properly done, the most unfavorable natural conditions may be neutralized.

The Cellar. If the drainage is insufficient, the first intimation will be given by moisture in the cellar. The dampness may be due to one of two or three causes. Moisture may find its way in from the bottom or the sides, or may collect on account of improper ventilation. In any way it is dangerous. The air in a cellar should be as dry and wholesome as that in the rooms above. In fact, the air in the house will be more or less contaminated if that in the cellar is bad, especially if there is a furnace in the cellar. To avoid damp bottom and walls, drain the site both beneath and outside the cellar. The cheapest and in many respects the best way to insure perfect drainage is to excavate from six inches to a foot lower than required for the walls, giving a uniform slope to the bottom of the trench from some point both ways to the outlet. Fill in this extra space with cobble stones carefully placed as shown in the sketch. If the bottom is wet and springy two or three cross drains put in beneath a cement bottom will insure good drainage there. An imperfect substitute for the cobble stone drain beneath the walls may be made by putting a four inch tile drain just outside and six inches below the wall and around the whole foundation. Faulty and improper construction of the walls themselves often leads to unhealthy conditions. Water may best be kept out of them by laying the stone in hydraulic cement. But if this is too expensive, the walls may be laid up dry, then pointed and covered on the outside by a coat of hydraulic cement made smooth from top to bottom so the water will readily run off. Another precaution that should be taken is to fill around the wall with gravel, in order that water shall not be forced through by an impervious soil. Water from the roof should not be discharged alongside the walls.

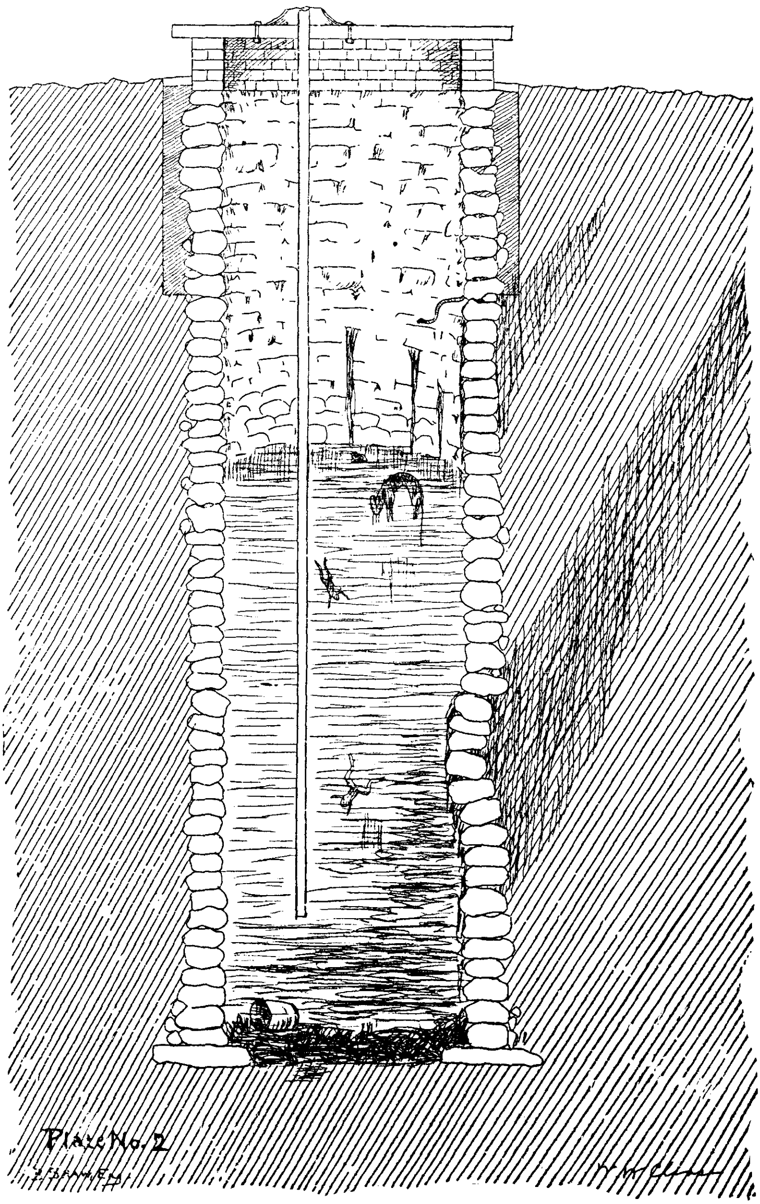
A cement bottom for the cellar is to be advised, as it is drier and easier to keep clean, and prevents any unhealthy emanations from the ground. As cellars are frequently constructed, they become musty, the walls are always wet and covered with mould and slime. The drainage is insufficient, and as a consequence there is an anual inundation, when the water either has to be bailed out or is allowed weeks in which to soak into the ground, carrying with it a large amount of decaying matter which later poisons the atmosphere of the cellar and renders it a fit nursery for disease germs.

Ventilation of the cellar is essential, but, if improperly done, may become an actual source of danger. If the windows are opened in the middle of the day when the temperature of the air outside is much higher than that inside, a current of warm air passes into the cooler, and, as a result, there is a condensation of moisture and a damp cellar; while if the windows had been open only at night when no such difference in temperature existed, the condensation would not have taken place, and the cellar would be dry.

Water Supply. Water, unless furnished from the city or town water system, is obtained from one of the following sources;—springs, brooks, surface wells, deep wells, or cisterns. Taken from any one of these it may be perfectly wholesome, or actually dangerous to health, and the fact that the most dangerous water may be clear, sparkling, and of a delightful flavor, often makes it difficult to tell whether we are taking a dangerous draft or not. In other words, we can not decide as to the purity of water by its appearance, smell, or taste. We may, however, judge with some degree of certainty as to the quality of the water if its source is known. Water taken from isolated springs and mountain brooks is usually very good; but is liable to contamination from dwellings higher up on the stream, or above the spring.

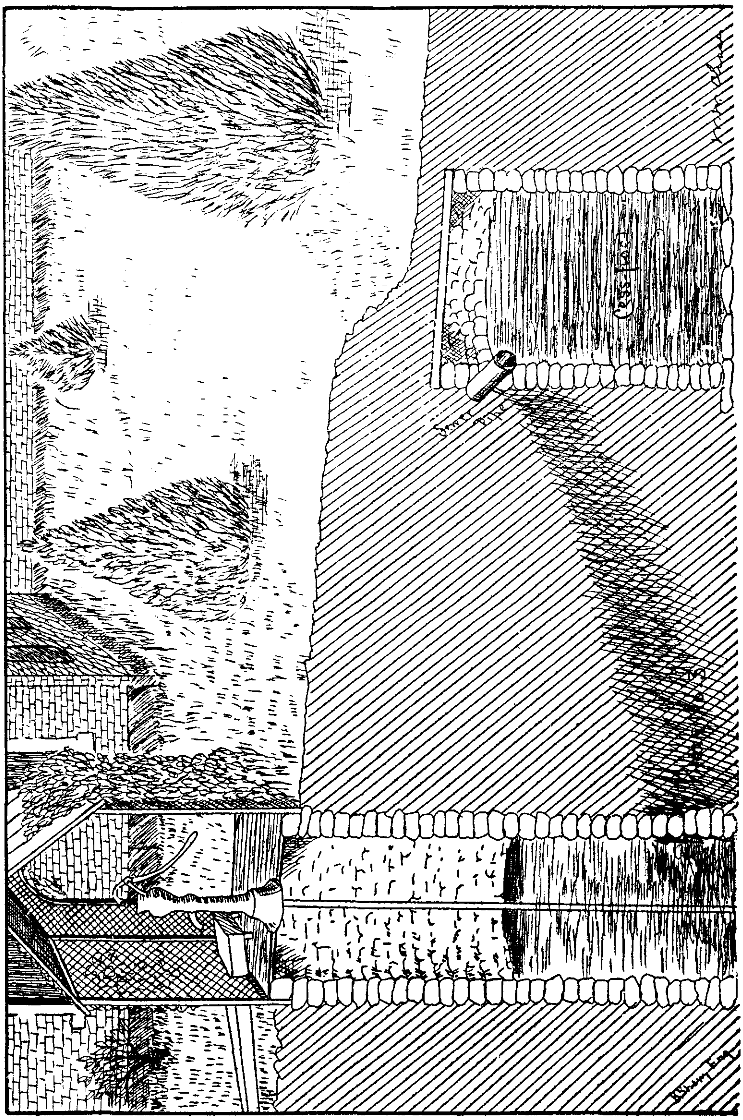
Surface wells probably furnish the most dangerous water. As they are usually situated they are nothing more nor less than cess pools, receiving the drainage of the house, outbuildings, and barns. A glance at the accompanying cut will impress this on the mind better than words. It illustrates a very common disposition of farm buildings and the well. In such an arrangement it is not difficult to find the well within ten feet from the barn yard, and within fifty or a hundred feet from the privy and sink spout. Tuberculous animals may live and die in the barn yard, while the waste products from consumption and typhoid fever patients are deposited in the privy. A well sunk in the ground anywhere, no matter whether it takes its water from the soakage of the surface, or strikes a vein as large as a small brook, is bound to receive the greater part of all water that falls or runs upon the surface in its vicinity, and the distance from which it will draw this surface water is limited only by the depth of the well. In all probability a well which is thirty feet deep will absorb a large proportion of the water falling upon the surface over an area one hundred feet from it in every direction.

It is quite generally supposed that a small body of earth will thoroughly filter any water that passes through it. This is true, while the earth is clear and pure; but as a filter the earth is a failure, for it destroys itself by its own action. It filters water, when fresh air does not pass freely through it, by collecting the particles of matter in suspension in it and retaining them in the spaces. In time the walls of the spaces become coated with the particles of filth, and then water will go through with as much filth as it had when it started. So a well which receives leachings from unclean sources is sure to become contaminated sooner or later. We have noted instances of such a well within ten feet of a barn yard whose drainage, as well as that from a privy two hundred feet away, is sure in time to enter the well; and besides, it often happens that during heavy showers the contents are actually washed into the well from



Cut showing how dead animals may be found in wells not properly constructed.

the surface. Suppose now that the discharge from the bowels of a person sick with typhoid fever is dumped into the privy vault, and by some of these means conveyed to the water in the well, and in that way taken into the system of a perfectly well person, and the disease contracted; or that a tuberculous cow or pig in the barn yard in the same way transmits that dread disease to the inhabitants of the house; let us not call it a dispensation of Providence, but meet the facts full in the face, and put the blame where it is due. While the leachings from the barn yard, privy, and sink may all pass into



Cut showing how a cesspool may back into a well.

the well for years without causing perceptible sickness, yet at any time a diseased person or animal may cause an outbreak of sickness and possibly death in the family. The danger from such a well can be materially reduced by a correct construction. If the surface of the ground is made to slope in every direction from the curb as far as possible, and the stoning of the well is made impervious to water by a coating of cement on the outside for a distance of several feet below the surface, and the curbing is made absolutely water tight, much of the filth which ordinarily enters a well would be kept out. All wells, however carefully constructed and guarded, are sure to accumulate more or less filth in the course of time, and should be carefully cleaned out once a year at least. Rats, mice, and frogs, if not dead cats and hens, will be found in wells from which water is being used constantly. The accompanying cut illustrates an actual case. It is well to be cautious, however, about entering a deep well, for it often contains so large a proportion of carbonic acid near the bottom as to render life impossible. Many a man has lost his life by carelessly entering this dangerous atmosphere. It is not difficult to tell whether a well may be safely entered or not. Lower a lighted candle slowly to the bottom. If the candle refuses to burn freely, there is an excess of carbonic acid, which would extinguish the life of a person almost as quickly as the candle was extinguished. This precaution should always be taken before entering any well or cistern.

There is another danger to wells, especially in country villages which have no town system of water supply, and where the so called modern conveniences are introduced into the houses. With no sewer or other outlet for the water closet, a leaching cess pool is generally constructed at on great distance from the house, and oftentimes so near the well that its contents are constantly leaching into it, as illustrated by the accompanying cut.

The deep well furnishes a much safer supply, but even this is not without its dangers. Of course it must draw its water from some vein, and if by chance this vein at some point comes near the surface, the water may become seriously contaminated.

Cisterns, if kept clean, furnish safe water, but they are too frequently allowed to accumulate filth. The water should be run through a cloth strainer before passing into the cistern, and the cistern itself should be frequently cleaned. A cloth strainer is recommended, as it removes the dirt, and can and should be often cleaned by boiling.

The ordinary brick filter in a cistern is a delusion. While it is new, if made of soft brick, it will act as a filter, but it soon becomes useless owing to the fact that it cannot be cleaned. Charcoal and gravel filters fail for the same reason, although they can be easily cleaned by taking out the contents, and exposing it to the sun and air for a month or so, when the material will make as good a filter as ever, if it is desired to use it again.

Residence and Apiary of Mr. Edward Tarr, of Castle Hill.

Ventilation. "Man's own breath is his greatest enemy." Ventilation is a subject which it would seem need not trouble the dweller in the country to any great extent, yet there is no doubt but a large amount of sickness and death is caused, even in the country, by the presence of bad air in our living rooms. Some authorities on ventilation say that impure air causes as many deaths and as much sickness as all other causes combined. Those who live in the country, however, are apt to think that all this death and sickness from impure air is caused in the cities. This, however, is not the case. Air is rendered impure by breathing, and by the burning of a lamp in a room. Dr. Leeds, an eminent authority on ventilation, says,—"Take a room fifteen feet square and ten feet high, and suppose a father, mother, and three children, together with a burning lamp, to occupy it for only seven minutes, and the air would be as impure as can be found in the great manufacturing city of Manchester, England."

Upon this subject I will only say that among the waste products from the body, air after it has been once breathed, becomes one of the most poisonous. And when we remember that a person breathes in the space of twenty-four hours a volume of air equal to twelve times his bulk, or on an average for an adult person 360 cubic feet, and that this amount of poison is discharged into our midst, the importance of ventilation, or a rapid changing of the air in a room inhabited by a number of persons, is of the greatest importance and especially so in the case of a sick room, or a room occupied by any person having consumption or any other disease in its active stage, and consequently mixing the already poisoned air with germs of disease. School rooms, filled to overflowing with children, should be very carefully watched, by parents, to see that all that can be done by the teacher to keep the room supplied with pure air without the introduction of drafts, is done. Teachers are apt to be very careless upon this subject, as well as others.

Disinfection. The Committee of Disinfectants of the American Public Health Association defines a disinfectant as "An agent capable of destroying the infective power of infectious material." Infectious material is anything that contains disease germs or their spores. The object of disinfection is to prevent the extension of infectious diseases by destroying these germs. This is accomplished by disinfectants.

Popularly the term disinfection is used in a much broader sense. Any chemical agent which destroys or masks bad odors, or which arrests putrefaction, is spoken of as a disinfectant. But there can be no disinfection without the presence of specific disease germs. So when one speaks of disinfecting a foul cess pool, or a bad smelling stable, or a privy vault, without the presence of disease germs, it is an erroneous usage of the term. This popular understanding of the term has led to many serious mistakes. The agents which have been found simply to destroy bad odors—deodorizers—or to arrest putrefaction—antiseptics—have been confidently recommended and extensively used for the destruction of disease germs in the waste from patients suffering with such diseases as cholera, typhoid fever, etc.

While an antiseptic agent is not necessarily a disinfectant, all disinfectants are antiseptics; for putrefactive decomposition, or ordinary decay of organic matter, is due to the development of germs of the same class as those to which disease germs belong, and the agents which destroy the latter, also destroy the bacteria of putrefaction, when brought in contact with them in sufficient quantity.

LIST OF DISINFECTANTS.

Disinfectants which have the power of destroying spores:

Fire; steam under pressure of twenty-five pounds; boiling water (with proper exposure,) twenty minutes; chloride of lime (in solution) bleaching powder? mercuric chloride (in solution) corrosive sublimate.

Disinfectants which have not the power of destroying spores but will destroy bacteria not forming spores:

Dry heat (250 F. for two hours;) sulphur dioxide (sulphurous acid gas, the gas formed by burning sulphur;) carbolic acid; sulphate of copper (in solution;) chloride of zinc (in solution.)

EXPLANATORY STATEMENTS.

That FIRE will destroy all kinds of germs goes without explanation.

STEAM at twenty pounds pressure has a temperature of 230 degrees; at twenty-five pounds pressure a temperature of 240 degrees. Moist heat at the first named temperature destroys the most resistant spores in twenty minutes, while at a temperature of 240 degrees it is effective almost immediately.

BOILING. In the absence of spores bacteria are quickly killed. It is safe to say that boiling for half an hour will kill all known disease germs.

CHLORIDE OF LIME is one of the cheapest and most efficient of disinfectants. It should be kept in air tight and moisture proof receptacles, and should contain at least twenty-five per cent. of available chlorine. It should be used in solution, which should not be prepared long before it is used. Germs of all kinds, including the most resistant spores, are destroyed by this solution, but it must be remembered that the solution itself is quickly decomposed and destroyed by contact with organic matter, and if the germs are imbedded in large masses of organic matter, their destruction with this solution becomes difficult.

MERCURIC CHLORIDE. (Corrosive Sublimate.) This is a deadly poison, and should be used with great care.

Note. This solution is colorless. One pint in 1,000 of water is sufficient. Strong solutions should be colored for safety against mistakes.)

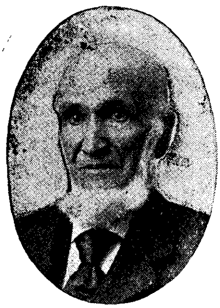
SULPHUR DIOXIDE. (Sulphurous Acid Gas.) Fumigation with burning sulphur has long been a favorite method of disinfection, in such diseases as yellow fever, small pox, scarlet fever, diphtheria, and other diseases free from spores. The presence of moisture adds to its effectiveness, and it should be constructed in closed apartments where there can be no escape of the gas.

CARBOLIC ACID in the absence of spores is effective against all micro-organisms, in an aqueous solution of two per cent. For disinfecting masses of excretion it should be used in solutions of five per cent.

SULPHATE OF COPPER in solutions of one per cent. strength is effective for all germs except spores.

ORCHARDING.

By PHINEAS WHITTIER, Delivered at the York County Institute.



Most people are not so free to speak of their mistakes as they are of their successes, but if my forty-five or fifty years experience in getting up an orchard is of any value to those intending to go into the business, I think a relation of some of my mistakes may be as beneficial as anything I could say.

My first and greatest mistake was in setting my trees too close (20 to 25 feet apart), a mistake that has been growing larger and larger in my eyes for the last fifteen or twenty years; so large, in fact, that I am almost on the point of cutting out at least one-half of the trees from my oldest orchards. The most and best apples an orchard will produce is before the trees begin to crowd each other. Late years I have set thirty-five feet apart, but am inclined to think forty feet a better distance. I think I do not exaggerate one particle when I say that one tree with plenty of room around it for sun and light, is worth more than six crowded together. I see the evils of crowding, more and more every year. In one case the top will spread out, be thrifty and productive for a long time in all parts. In the other the lower branches will first cease bearing, then die; while the top branches are growing skyward, making long smooth limbs to climb to get at the only few apples on the tree. Climb, I said, because there is no chance to get around such trees with ladders. Cutting off the large dead limbs, which are sure to be on crowded trees, causes decay in the trunk, and early death of the whole tree. And besides, the apples on such trees are more liable to be scabby and green, and it is a difficult matter to spray such trees, a matter I think we must all attend to if we would have nice fruit. I know that when trees are first set they may look far enough apart, but when they get fairly to growing the tops will soon close up the intervening spaces.

Another bad mistake which I made was in setting poor trees. I have set mostly seedling trees, that I have grown in my own nurseries. When I have taken the thriftiest, the ones that get large enough to set first, they have done as well as I could wish, but my mistake was in trying to get an orchard from the less thrifty, slower growing ones. I had better have let them alone. I have spent more time and expense in trying to coax them into a thrifty growth than would be necessary for five times the same number of good thrifty ones, and have not succeeded after all. If any one intends setting seedling trees, my advice is, don't do it unless you can have the first selection from the nursery. Not more than one-quarter of the trees from such a nursery should be set for an orchard. Another thing,—do not set seedling trees grown in soil much different from your own.

It is very risky business to set trees in the fall of the year. I once set 400 at that time, and snow came on before the ground froze, and laid on all winter, and I never had trees do any better. But at two other times I set 100 each year, and took all the precaution I could against freezing, but the snow went off in midwinter so that the ground froze quite deep, and it killed nearly all the trees,—one winter every tree. I claim that when a tree freezes to the end of the roots, it kills it.

Trees set in the spring extend their roots deeper and are not so liable to freeze out.

One year, in my earliest efforts in starting an orchard, when mice were plenty, I made a mistake in not protecting my trees from them, not realizing what rascals they are among trees, and I lost several hundred trees, and many more were badly damaged by them. Since then I have been careful to keep the snow trodden down around the trees, or to protect them with wire cloth coiled around them, which I consider the best of anything to put on them, as it can be left there the year round without injury to them.

As for a location for an orchard, I consider, as a general rule, a westerly or northerly slope the best, and a much protected easterly or southerly one the poorest. Of course there are many surrounding circumstances which may make many exceptions to this rule, such, for instance, as elevation or a chance for a free circulation of air; nor should the location be in too bleak a place, where the snow constantly blows off. River bottoms or intervales, low flat plains or land underlaid with a bed of clay covered with a shoal soil, should never be selected for an orchard. But a deep, somewhat clayey soil, is one of the very best. Almost all of our upland farms, where not too wet, are well suited for growing some of the varieties of apples. The Baldwin takes the lead for being the most profitable apple to raise, also for being the one suited to the greatest variety of soils. Rhode Island Greenings and Northern Spy come next, in my estimation. The best and safest way to decide what varieties to grow is for any one to observe what ones do the best in his own locality. The R. Russet is profitable in but few special sections, and in others it is useless to try to raise it; and it is the same with the Harvey, Bellflower, and some other varieties. It is useless to try to raise the Bellflower in any place unless the soil is very highly fertilized. The King is a shy bearer with me, and I have failed to find the locality where it is prolific. If there is such a place, it would be a very profitable apple to grow. The Hubbardston has done well with me; it is prolific and the fruit is of good and even size, and it is an excellent keeper for late fall and early winter. I have had them sound as late as June, but, of course, off flavor. The Snow apple is a profitable apple to raise if the scab can be controlled, and I think it can by spraying for it. I know of one New York orchardist who has been so successful by such means that he is grafting over other good varieties to Snows, because he can get so high a price for them. The Gravenstein is another variety that brings a high price in the market, and should be grown where the conditions are favorable for its development. As there are so many Ben Davis being planted in the State, perhaps I ought to say something about them. They are everywhere acknowledged to be a poor apple, except for cooking, and I do not raise them; but in buying I have frequently got lots of a few barrels, and I have seen other lots, and I must say they were not very attractive to my eye. They were generally too small and of too dull a color. The trees are early and prolific bearers, and I think high cultivation would be what they might need. It is claimed that they are not so subject to the attacks of the Trypeta as are most other varieties, and that is a good recommendation for them. I should say that they might be a profitable apple to raise for canning or evaporating, but I should not plant largely of them depending on the price keeping up to what it has been.

In view of the ravages of the Trypeta, for which there is now no known sure remedy, I would not advise any one to plant largely of early or fall fruit for a market orchard, not even if near a good market. I think perhaps it would be a good plan to have a few trees of early sweet apples to trap the rascals in, if great care is taken to gather and feed to stock all the infested fruit, as that is now the only known way to reduce their numbers.

I have changed my mind somewhat, of late years, as to the best trees to set. Near the time I commenced setting trees I got 100 New York trees. They were not so good ones as we get from there now. Many of them were club-footed, crooked, and poor in every way, besides being all sorts and kinds, as I learned later from what few lived. I was so disgusted with New York trees that I did not try any more of them, but continued to grow and set seedlings, with the results I have named. I am satisfied, by my experience for the last six or eight years, that if any one can get good New York trees, true to name (which we cannot often do when we buy of agents) they are the best ones to set. The greatest trouble with them is that, if the first winter after they are set happens to be a hard one for trees, they are quite liable to winter-kill; after that there is not much danger. For some reason New York trees will outdo seedlings raised here in thriftiness, whether it is because of a better development of the sap vessels or from some other cause, I cannot say. As I understand by nurserymen, their trees are raised principally in Missouri and Kansas from imported seed to one year old, and bought by New York nurserymen to graft and make their nurseries of. If so, perhaps this has something to do as to their thriftiness.

In preparing land for an orchard, if it is poor or exhausted it should be plowed and fertilized, but if it is a good fertile soil, I do not consider this absolutely necessary. I have set trees in cultivated soil, but I have set a large share in sod, and they both did well. But more pains must be taken with them in sod land,—a larger hole dug and the earth well mellowed up and mixed with some fertilizer. And after setting they should be mulched, with manure first, and afterwards with something to kill the grass. In setting, after suitably trimming the roots and top, fine soils should be worked in among the roots so as to leave them in their natural position, slightly deeper than when growing in the nursery; and if on land that heaves by freezing, it is very necessary that they should be mulched, whether cultivated or in sod. No grass should be allowed to grow within four feet of the tree until it has got a good start, with trunk some three or four inches in diameter. After that the best thing to do is to pasture with sheep, hogs, or poultry. If it is not convenient to do that, then there are several methods which I have adopted to keep up the thriftiness of my trees. One is to plow and fertilize between the rows to within five or six feet of the trees. I once cultivated a portion of a young orchard close to the trees. In the spring when the frost came out the soil was so loose and soft that the wind racked the trees so that I had to shore them up, and some of them were raised partly out of the ground. I would never plow an orchard on shoal, moist soil, where the roots do not penetrate deeply, but top-dress. One orchard of twelve acres I top-dress with manure. One of twenty-two acres I mow and leave the grass in reach of the roots of the trees. From my experience I am satisfied that bearing trees need something besides animal manure, such as muriate of potash or wood ashes, together with ground bone. The ashes and muriate of potash would be beneficial as a top-dressing, but I think that the bone should be worked into the soil to get much benefit from it, and of course the potash would be more beneficial mixed with the soil.

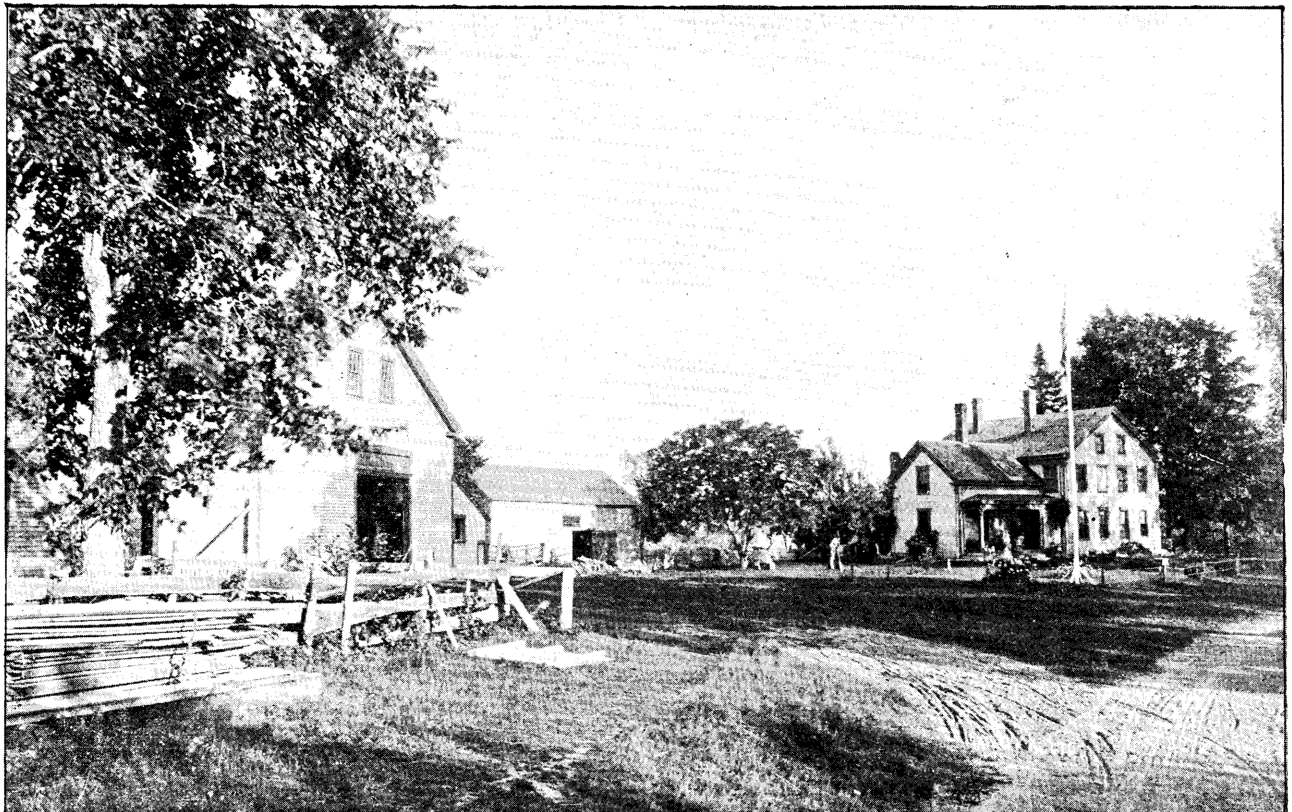
If seedling trees are set, they should be grafted after they get to growing quite thriftily. A hub one-half an inch in diameter can be successfully cleft grafted. Some spurs or small limbs should be left to take the sap while the scion, only one in a hub, is getting started to grow, then watched, and all the natural sprouts that are robbing the scion too much, taken off.

If older trees are to be grafted, the lower limbs should be cut well out from the trunk, and those next above farther in, so as to give the scions from the lower ones a chance to grow up by them and have the sunlight; and so keep drawing in as the top is reached, so that the outline of the hubs will be in the shape of an open umbrella. Enough scions should be put in the first year to make a good top, and a plenty of spurs and small limbs left on to take the extra sap. The new sprouts that come out, especially those nearer the scions, should be left off. The next spring most of the natural larger limbs should be taken off, and the third year all of them. Where there are two scions in one hub, one of them must be sawed off with a slanting cut, taking off quite a corner of the hub. Leaving a scion that will make the best balanced top. The chance for increasing our orchard products is as, nearly unlimited as we could wish. All of our hill farms are well suited for it, and many others have good orchard land on some parts of them. Not only this, but there is a chance to more than double the present products of the orchards we now have, by fertilizing and caring for them as they should be.

We can extend and increase our market for apples by putting them all into the market as an extra number one article, and this can be done by proper management. I think it is of more consequence to know how to take care of and dispose of a crop of apples, so far as profit is concerned, than it is to know how best to grow them. I will give you my method, then you may judge whether it is the best or not. I pick an sort in the orchard, and lay them into boxes or barrels, handling carefully so as not to bruise them in the least, putting generally about one-half of the best into the store house to keep for market, and all others that are large enough go for canning or evaporating. I have fitted up for doing both. When I get ready to dispose of my green apples, I again more carefully sort them, and put them up alike all through, strictly number one, and send to Boston to be sold on commission, and they always sell for considerably more than the highest market price.

The second quality, including the suitable windfalls and generally the fall fruit, I either evaporate or can, taking particular pains to have all the operations done in the best possible manner, so as to put up a very nice article, which will sell readily in the market fifty per cent above the highest market price. By so doing I make the poorer apples net me more than the usual price of number ones. Where the profit comes in is in putting up a very nice, uniform article. This can be done only by careful attention to every minute detail. I consider that I double my net income by disposing of my apples as I do, instead of selling in the usual way.

I think apples can be raised for seventy-five cents per barrel for number one and number two, and be more profitable than most other branches of farming. They are worth that at least for canning or evaporating, and put up as they should be they are usually worth much more. But when apples drop to anywhere near that price the best way is to put up those that will make an extra fancy number one, good size, good color, and smooth,and send them to a reliable commission merchant. Such ones will always sell for a good price, no matter what the state of the market is. Then put all others into shape to hold for a satisfactory market, by canning or evaporat-



"The Elms," Residence of Hon. Dimon Roberts, Lyman.

ing. At least I have found this to be very much the best way, and I speak from many years of experience.

I never have done any spraying, but I am satisfied, from all information I can obtain, that where it is thoroughly done it is of great benefit, and I intend to give it a trial, especially for the scab and the many numerous leaf eating insects and worms, and if it kills some codlin moths I shall not care. The fungi that attack the trees and fruit, and the leaf eaters, do more damage late years than all other pests, except that I am afraid the Trypeta is fast coming to the front, as our worst enemy. I am satisfied that spraying, like everything else, half done is of but very little benefit.

I have not said much in relation to insect pests, as I understand one who is very much more capable of doing justice to that subject than I am, is to speak of them, and I expect to learn something from him. But as connected with the disposition of apples I wish to say, that I have had but little experience with the Trypeta. One year ago last summer was the first I saw of them in my orchard, and I may be mistaken in my idea that they do not seriously damage apples until they are nearly full grown and begin to ripen. If I am correct in this, then it would be an excellent plan to use them for canning or evaporating as soon as they get large enough and in that way save all of the sour apples. Sweet ones are not wanted for those purposes.

INSTITUTE, CUMBERLAND.

Saturday Forenoon, December 7, 1895.

MR. VINTON.

These meetings are held for the benefit of the farmers, and are supported by an appropriation, which we have to pay in taxes, which is supposed to be about sufficient to hold two institutes in a county. This one has been appointed here, and I do not know of a better place in which it could be held. It has been well advertised, and we are going to have a good meeting. This afternoon Ex-Governor Hoard of Wisconsin will tell us about dairying.

Now this is an excellent farming region,these men are upon farms, and what are these farms for? I do not think the main object of the farmer is to get rich. The great effort nowadays is to get rich, but I do not think the primary object of the farmer is to get rich, but to gain a living. The question is, What shall a man have to eat and drink, and wherewithal shall he be clothed? We want to make ourselves comfortable, and of course the more money we have the better we can do this. If the farmer goes through the year comfortably and independently, and closes it as well as he began it, he is all right if he could be sure to do that every year. But we are growing old and by and by shall not be able to do this, and we want to lay up something all the way along. While the farmer can get along better than anybody else without money, still he must have some money to pay his taxes, which are every day increasing, as well as to lay up for time of need, and the question is, In what department of farming is he going to get it? I have looked the matter over pretty carefully this year, and I do not see much for the farmers in this section to get money from except dairying and hens. You have not much hay to sell, or beef, and pork is very low. I think the farmers must rely upon the dairy and the hens for ready money. The poultry house will furnish it quite largely. A woman near my home is doing a good business in selling eggs in Boston; and the price of butter has been fairly good through the year. I was surprised to learn from a farmer here that he sells butter for thirty cents a pound all the year round. At that rate a man could make money by keeping cows, if he had to buy all their feed, though of course not so much as if he can raise the feed. We have come into this dairying region to talk to you more particularly about dairying, and this morning Secretary McKeen will talk to you upon stock feeding and Prof. Gowell of the State college will talk to you upon the silo.

STOCK FEEDING.

By Sec. B. W. McKEEN.

Mr. CHAIRMAN, GENTLEMEN: I am very glad to be with you here this morning, but I feel that I owe you an apology for appearing before you so illy prepared to do any work that will be acceptable. At the close of a week of very hard work I find myself hardly in a condition to do my best. We are always glad to meet together in our institutes for questions and discussion, and the consideration of these matters that pertain very closely to the work on our farms.

This idea of stock feeding is something that enters very cardinally into the farm work of the farmer in the State of Maine, no matter in what section he may be placed. We occasionally find men who claim that farming can be carried on successfully without stock husbandry; that the fertility of the farm can be maintained by the use of commercial fertilizers. But experiments so far have demonstrated that this is not a fact,—that stock husbandry must necessarily be a part of our farm work. I have no doubt but that in some special localities, by allowing crops to be plowed under to aid in fertilizing, or something of that kind, we may keep up the fertility of our farms without stock husbandry, but as a rule we must come right back to this method of feeding the crops to the animals that we keep, for the purpose of maintaining the fertility of the farms, as well as for the purpose of getting a revenue from those animals. And remember that the value of the farm is not in its size,—not in the number of acres, but in the capacity of those acres for producing crops. The fertility of our farms is our stock in trade, just as much as the merchant's goods upon his shelves are his stock in trade. We will treat this question upon general principles; we will try not to lay down cast iron rules for individual practice, but will consider it in the light of general principles,—principles that are true in Cumberland and in Aroostook county.

One of the first things for a successful feeder to consider is where his animals are to be kept, particularly in the winter time. None of us, however much of valuable fodder we have, whether purchased or grown upon our farms, can expect to feed it to our animals with a profit, unless we have fairly comfortable and light quarters for them. So I believe that the barn problem comes into this question. In no state where I have travelled, looking over our agricultural resources, have I found so much money invested in barns as in the State of Maine. Our barns are elegant, many of them unnecessarily expensive. But some of our expensive barns are not the best barns. The best barns are those in which the thermometer never falls below the freezing point and sunlight reaches the animals from early morning until night. There is something almost mystical in the influence of sunlight in the winter tie-up. We feel the heat as it passes through the window glass and is confined in the barn. Just now we are confronted with danger from infectious diseases. These are engendered, not in our light, roomy tie-ups, but in dark, unventilated quarters. Let us start with the idea that we are to have a warm and a light tie-up. Remember that a light tie-up is a healthy tie-up, and a dark tie-up is one in which disease germs thrive, and should be avoided every time.

We will assume that we are provided with these quarters, and we will now commence to study our feeding problem. It seems to me that the first principle for us to consider, whether we are situated in the town of Cumberland or the remote towns of the State, is that we shall produce upon our farms, as far as possible, the food that we feed to our animals. I do not mean in the form of grain to a large extent, but I do believe that we should prepare ourselves with fodder crops for all seasons of the year, as largely as possible of our own production, depending on the market only for those crops that we cannot raise to good advantage, or in sufficient quantities for our use upon the farm; laying this down as a foundation principle,—that none of us can afford to go beyond the limits of our farms for the purchase of any stock fodders until we have exhausted the capacity of our own farms for the production of these fodders. And also remembering that by studying into a variety of crops and growing a little of each, we may be able to increase, materially, the capacity of these farms without additional expense.

What shall these crops be? We will start in the spring of the year and consider what we will grow for our animals, and how we will feed them during the summer months. Of course we are all aware that the sweet, nutritious pasture grasses are the cheapest possible food for the summer consumption of our animals. But have we enough of this food? Is there a farm in the State of Maine on which the pasturage is ample from the early spring until the fall? The pasturage is not sufficient, and for that reason it becomes us to look carefully into this matter and see what we shall grow to add to its capacity, and to take the place of those pastures when the droughts of summer come. I doubt if it is wise for the board of agriculture to recommend to all farmers in all sections entire soiling of their animals during the summer. I mean by this, keeping their dairy animals in the barn and depending entirely upon the crops which they grow. But I am fully convinced that it is necessary for us all to adopt a partial system of soiling, if we would increase, rather than diminish, our stock husbandry. The great soiling crop in the State of Maine to-day is the corn crop. There is no crop that we grow that produces as many pounds of food nutrients to the acre as corn. There is no crop that we can grow that the animals will eat so readily and for so long a time without tiring of it, as corn. In my experience there is no crop that is so valuable as a forage crop as corn. In growing this corn crop for soiling we should consider the fact that it is of no great value to us,even to feed green, until it has reached a certain stage of growth. An immature corn stalk contains but little besides water; a fairly matured corn stalk is a valuable food product. There is something peculiar in the corn plant, in that the grain and the stalk are made up of about the same materials in about the same proportions; so that the grain differs from the stalk only in that it is more condensed. Very much of the value of the stalk is put into it, as I might say, during the process of maturing the ear. I doubt if any of us can afford to sow our corn for soiling so thickly that it will fail to produce ears. Nor can we get very much benefit from it if we feed it in the early part of the season. Corn for soiling should be planted in succession, a little piece at a time, so that we can begin to feed as early as possible in the month of August, and feed as late as possible, having a succession of corn to feed all along this period of time, all of which shall be fed at the time when the ears are in the glazing stage as nearly as possible, rather earlier than later. It is at this period that we get the best possible results.

If you have followed me thus far you will see that we have not provided for anything up to the first of August, and possibly if you have an abundance of pasturage and do not care to stock your farm heavily this will be as early as you will want a soiling crop. But possibly you will want something earlier, and what shall it be? The earliest spring crop that I have observed is a crop of oats and peas. The early peas should be sown in some sheltered place near the barn, on light soil prepared in the fall, at the rate of two bushels of peas per acre. They should be worked into the soil quite deeply, either with a spring toothed harrow or a plow; then a day or two after, sow your oats and harrow them in, just as though you were seeding down. Then let the piece alone and see how the crop will grow. When the peas have reached the boiling stage they are ready to feed, and the crop should be cut. If the animals have not been accustomed to eating the peas, they may not eat them very well at first, but as soon as they get a taste of them in connection with the green oats, they will eat them readily. You will notice that there is nothing that they will eat with any greater relish, or that they will do better upon according to the effort that it takes to grow them, than upon these oats and peas. You can sow them in succession, at intervals of ten days or two weeks, and you will have them to feed from the very first of July up to the period when the early corn is mature. If you want a greater variety, Hungarian, the millets, and clover are good,—any of these crops that you can get hold of and feed to good advantage. Remember that you are feeding from the resources of your own farm, a valuable food crop, a crop that has cost you comparatively little, and you are feeding it in the period of its growth when the animals will eat the largest amount and when it can be digested with the greatest ease; and you are able to keep your animals up to the highest degree of production without the high priced grain. If you wish to have a soiling crop earlier than this you must prepare it in the fall. Upon my own farm I have a small piece of winter rye, that was sown on a piece of corn at the last time the corn was cultivated, I think it was in August. We sowed the rye through the corn and cultivated it, not deeply but covering all the ground we could. The rye has grown up finely and covers the ground in a mass, and we expect to get quite an abundance of early succulent food. Then will come the clover, if that does not carry us to the time our oats and peas are ready; then oats and peas, Hungarian, etc., up to the time we feed our earliest corn, and then the earlier and later corn. And now we come to a time when it seems as though we must run against a stump, here in this cold climate. But let us look for a moment. A man is wise, I know, who does not drift, but has a purpose; but it is always wise to see if we can avoid difficulties. From the time our frosts come in September to the time when our animals are confined entirely in the barn there is quite a long period, and what shall we do with them? Shall we tie them in the barn and feed them on our dry fodder? Shall we allow them to roam over our fields and feed down our newly seeded lands? If we have a little piece of ground from which we have taken the winter rye or the oats and peas, and will fertilize it again with some quick acting fertilizer, and sow on some barley or peas, we shall be prepared with a crop which will stand these early frosts and afford the animals succulent fodder at the time when all else is failing; when the corn crop has gone past, and we do not wish to feed our fields. I believe that this matter is one that should be brought to the consideration of our farmers as much as any other one thing,—that they should be prepared with something for a succulent fodder crop to give their dairy cows from the time the fodder fails them in the fields up to the time when they want to tie them in the barn.

The question of silage comes in here. I believe that none of us can afford to allow our cows to shrink in milk, or allow them to feed on the frozen grasses of our fields to any great extent, at that time.

I believe I have followed this matter along from early spring until fall, and shown you how it is possible to give our animals a succession of soiling crops, each of which is fed at the period of maturity, when it is of the greatest value. That brings us to the matter of winter feeding. What shall we feed in winter? We are reading now very much about a balanced ration. Hardly a newspaper reaches us without a feeding table in it, or without the consideration of some questions relating to this feeding problem. All of these investigations are giving us very much light in relation to this work, and are of very much value to us; but are we who are actively at work in this business living up to our advantages, and up to the possibilities that we might have for learning, independent of these efforts of our scientific investigators? I believe that those of us who are feeding farm animals, particularly milch cows, have in our barns laboratories in which we may learn what it is possible to do with the fodders we have at hand, in relation to feeding a balanced ration, in relation to feeding at a profit, in relation to feeding economically. If we will but study the appetites and dispositions of our animals in our feeding, and will vary our fodders so that each one of them shall be eaten with a relish, we have this to comfort ourselves,—that we are getting the full value of each one of those fodders. There is nothing that grows upon the farm that is not of some value as a food product, from the coarsest straws, even the bean straw that we too often waste, up to the finest products that we grow. Each and every ton of that fodder has something of food value in it, and if we can arrange in some way to feed it to our animals so that they will eat it readily, it can be fed with a profit, there is no question about that. But the first thing to consider is the production of a variety. The man who is feeding the same quality of hay from the first of November to the first of April, and nothing else for a coarse fodder, is feeding that hay at a loss unless it is balanced very carefully with a grain ration; and then I believe it is fed at a loss. The man who feeds his stock one kind of fodder until that is gone, and then another kind until that is gone, is also feeding at a loss. But the man who has a variety of fodder and is feeding a little of each kind every day, and feeding it in such a way that the animals will eat it without aversion and without leaving any of it, is feeding as closely to a balanced ration as he can with the fodder at his command. Hay must constitute the bulk of our feed, other things coming in, in the way of a variety. If we are growing Hungarian, that makes an admirable link in this winter feeding. Our corn fodder (if we have not a silo), oat hay and pea hay, all cured nicely and fed to our animals in good condition and at proper times, will help to make this variety, which will lessen the amount of grain required, and help out in the profits which are sure to come from our successful winter feeding.

The appetite of the animal is but the natural craving for that class of food which it requires. Several years ago I had quite a lesson along this line. We were feeding our cows on the best of hay until pretty well along in the winter. Our young animals had been obliged to eat the hay that was not as good. We got out of this cheaper hay and thought we could hardly afford to feed our good hay to young animals, and so I purchased a few loads of cheap hay. As we drew it into the barn and commenced pitching it off some of it fell down before the cows, and we found that although they had some of our best hay in the crib they at once let that alone and commenced to eat this cheaper hay that we were buying from the neighbors. I made up my mind that those cows did not know anything, and we become almost provoked with them, and took the hay away from them. We thought if they ate any quantity of it their production would be lessened. And then a thought came to me like this,—why were those cows eating that hay unless it was going to be better for them? We changed, and fed them occasional fodderings of that hay, which they ate with a relish, and also they ate the former hay to better advantage and their production increased. From that time until this, whenever we have fed a foddering of any kind it has always been fed the whole length of the barn, to all the animals. I think that this idea of feeding our different animals differently, keeping a part of them on the very best of our fodder and the remainder on the very poorest, is a very wasteful practice and one which we should avoid. I think we should in each and every instance make the variety as large as possible and feed all of our animals alike. If we have cows that are fresh in milk we can, with the cheaper fodder, feed an increased grain ration. I think that as we more fully appreciate our corn plant, and the value that we may get from it, we shall all of us grow enough of it so that we can afford to put in a silo, according to the principles that may be spoken of later on by the professor. Perhaps it may be well for me to dwell briefly on the methods of growing corn. I think you must have excellent soil in this locality for the corn plant, and we know that you have a good climate. My experience in the past year bears me out in saying quite positively that the drill planting of corn is preferable to the hill planting. There are various reasons. By scattering the corn all along in the drills the roots are more evenly distributed and are able to get hold of the soil more readily, and we are able to get a few more stalks on to the ground without shading it very much. If the soil is light and dry and the rows go north and south, or about in that direction, the partial shading of the ground will do no harm. The stalks will ear better and we will get a larger growth in drills than in hills; and the labor of hoeing will not be as great in drills for the reason that if we use the corn planter and plant in drills there will be but one kernel in width and we can cover nearly all of the ground with the cultivator. The hand hoe has had its day, and we must use the cultivator and similar instruments in cultivating our hoed crops. And for that reason it becomes necessary for us to get the crops into the ground so that we can do this to good advantage. It is not necessary to check,—it is simply necessary to have our rows straight, and a kernel in a place. I would sooner put a careless man on to my mowing machine than on to the cultivator. We have a little rule that I have followed in regard to cultivating. Governor Hoard said last night that he thought he had made a great discovery, and behold, when he came to talk about it, there wasn't a woman in the country but knew all about it years and years ago. I thought I had made a great discovery, but I found a dozen men who claimed that they had the original patent. It is to begin on the left side of your piece, keeping your cultivator close to the right hand row. If you have a boy to drive tell him to drive the horse a little closer to the right hand row than to the left hand, and keep your eye and thoughts on the right hand row. When you get across the piece come back between the same rows, still keeping your thoughts on the right hand row. By this method of cultivating you can do more work in one day, with a slow, careful walking horse, than you could in two days by the old method. Seek for light work with the cultivator, and level culture as far as possible.

The preparation of the soil for corn is probably something that we need to talk about. The soil must be prepared very thoroughly. Of course if we talk about plowing we shall get into trouble; some will want to plow shallow and some deep, some in the fall and some in the spring; some will want to plow the manure in and others will want to harrow it in. But let me say that in my honest opinion I doubt if there is difference enough either way to warrant our spending much time in discussing the question. We should plow when we can do it to the best advantage. If we are ready to plow in the fall, let us plow in the fall; but if we are busy then I do not think we are losing much except time if we defer the plowing until spring. Generally speaking I believe in shallow plowing, although in some localities I think better work may be done by deep plowing. My observation is that I should plow shallow, and plow the maunre under. Keep your ground as level as possible up to the time when the corn is to be harvested. Level culture is the culture that should be adopted in every instance. The harrow or weeder may be used to good advantage, especially if we use the horse corn planter. I never have had the courage to use the harrow as much as some, but we do use the Breed's weeder to very good advantage, and I have no doubt that the harrow may be used, except on pieces of land which are very stony, or on which witch grass is very abundant. Our weeder is similar to a horse rake with the teeth very near together. It took me some little time to find out what there was about that machine that would cause it to take the weeds and clear the corn plant. But when I came to consider that the corn was planted so deep that it was below the weeds, the secret was solved at once. So we can destroy the weeds by going over the piece with this weeder, following later with the deeper cutting cultivators. The practice of killing the weeds by hoeing is changed. By the preparation of the soil, and carefully using the weeder and hoe, we are preventing the weeds from growing. We want to use the weeder as soon as the corn is out of the ground, and I think even before. I should go crosswise the piece, if I wished, even before the corn was up.

The sowing of a catch crop in our corn fields that are well fertilized, as an addition to our stock fodder, is a practice to be commended. A gentleman in Bethel sowed rape as a catch crop, the last of August, to be fed off from the field by his cows. The results were very satisfactory as far as the condition of the fodder was concerned, but he found it was not a good feed for his cows when he was selling butter to private customers. I have noted other instances in which it affected the flavor of the butter. But it is a very good fodder to feed from the fields for young animals or sheep. If we do not wish to use this we can take barley or rye, either of which will make a very good crop for a catch crop. Many of our farmers, instead of using grains for seeding down, are adopting the practice of sowing their grass seed in their corn fields at the time the corn is cultivated last. The grass will grow up very nicely, if shaded by the corn, and there is quite a surface of ground between the rows in which it can grow unobstructed, and the harvesting of the corn does not injure the young grasses so much as the harvesting of the oats would the next year. This is a practice that is followed in my own section, and gives very good satisfaction. One of the largest farmers in the town of Farmington told me that he never should use any other method than sowing the grass seed in August and cultivating it in at the last cultivation of the corn.

Ques. Can you tell me anything about buckwheat?

Ans. That would hardly make a good fodder for fall, as it is very easily injured by frost, but it makes an admirable soiling plant for the summer. I doubt if there is anything that we can get for a soiling crop in the fall that will equal barley and peas. Oats will do nicely, but sown so late they will be more apt to rust than barley. I have had no experience with buckwheat, but I should doubt its value to be fed after the frost comes.

In considering this corn plant in connection with our work, either in the summer or in the winter, it is necessary for us to know that there is more of the value of the corn, acre for acre, in the fodder than in the ears. This may seem to be quite an extravagant statement, but from certain analyses, and from the experience of our farmers who have fed it carefully, I have no doubt but that it is correct. There are more pounds of food material in the fodder from an acre of corn, than from the ears,—more actual weight in food nutrients, more pounds of milk or butter. For that reason you see that it is of great importance for us to take care of that fodder in such a way that it shall be in the best possible condition for us to use. As I said before, the corn stalk and the ear of corn are made up of about the same material in about the same proportions, and you will see that we have a larger number of pounds of actual food nutrients in the fodder than in the ears. Those of us who have been husking our corn very carefully, and taking it to the mill to be ground, and feeding it with great care, have been saving the smaller half of our corn crop and wasting the larger half, if we have been allowing the fodder to wither or decay. This consideration will give us an idea in relation to the great value of the corn plant, and help us to consider the question of the silo.

In connection with feeding our farm animals comes in this question of the fertility that we get from feeding those crops. Everything that we grow and feed to animals has a certain amount of fertility in it that may be returned to the soil to grow another plant. If a house is burned it is destroyed, and we have to get new material to build another house; but in the feeding of a plant to an animal a large part of it still remains, in the undigested portions of that plant, and in the waste from the animal system. It is simply a great round, taking from the soil and sun and rain to build a plant that will grow an animal and then be returned to the soil to grow another plant to grow another animal, etc. So that we must look carefully after the matter of saving our farm fertilizers, remembering that we get nothing in the commercial fertilizers that is not in the farm manures. It is too late in the day to talk about the mysterious values of commercial fertilizers. We simply know that we get results from them because they contain the same things that are contained in the farm crops. Generally speaking, our farm fertilizers, particularly the nitrogenous parts, may be made of more value because we can be certain where they come from. We can know that the nitrogen in our manures comes from the cotton seed and corn meal, and the hay, etc. We can know that the phosphoric acid comes from the crop and will produce another crop if we will let it. The proportion of the waste of these plant nutrients that we have to contend with in the feeding of our animals varies greatly according to the different classes of animals to which they are fed. In our farm crops fed to full grown animals not working or giving milk there is but very little waste as the food goes through the digestive tract of the animal; if the animal is young and constantly making flesh, bone, and muscle, more is wasted; if the animal is hard at work more is wasted; if the animal is a milch cow and giving milk, more is wasted. But the proportion, I think, is hardly more than twenty-five per cent; so that if we know the number of pounds of nitrogen and phosphoric acid contained in a ton of any of the ingredients that we are feeding, we may know approximately the number of pounds we may return to the soil to help grow another plant. I made a little comparison in relation to this matter, that may be of use to us, showing the number of pounds of plant food that we have in some of the different materials at hand, as compared with the average high grade fertilizers that we are all familiar with. I have no doubt that you are feeding quite large quantities of cotton seed meal, one of the richest nitrogen products that any of us are feeding. In one ton of cotton seed meal after we have fed it we may have as many pounds of plant food to return to our soil as will equal 1006 pounds of the average commercial fertilizer. We should not think of wasting a pound of that chemical manure that has cost us so much money, or letting it remain in any place where it would be wasted. But are we taking as good care of this pile of manure that is of as much value? Until we are we have no right to complain of hard times and lack of revenue upon our farms. We are feeding wheat bran in quite large quantities, and from every ton we may expect an increase in value that will just equal in number of pounds the plant food that we would get in 553 pounds of the average high grade fertilizer. We are selling hay from our farms, and we reckon that if we sell a ton of hay in our markets for $10 we have the $10 net. We should see that we have taken from our farms a certain amount of plant food that has diminished their capacity to produce other crops, and thereby diminished their value just as much as the stock in trade of a merchant is diminished if he takes down a web of cloth and cuts off a piece and sells it. The fertility of our farms has been diminished by the amount of plant food taken off, which will come not far from the amount contained in three bags and a half of the average high grade fertilizer. That, of course, should be charged up against this method of handling our product. We are buying and growing quite large quantities of corn meal. That is the poorest, ton for ton, of the articles that we have been considering, but we would get from one ton as many pounds of plant food as from 240 pounds of the average high grade fertilizer.

You will notice that I have hardly told you how many quarts of the different kinds of grain, or how many pounds of hay to feed. We steer somewhat wide of these questions because we believe that every man has to answer them for himself .There are certain general principles to be laid down, but as to whether a man should feed twenty pounds of hay and five of grain, or fifteen pounds of hay and twelve of grain, is something that we can hardly deal with. This question should be answered by every farmer by the light of his experience and observation upon his own animals; remembering that all of us should seek to feed our animals in such a way that they will be in a proper state of health, because no unhealthy animals will ever give us an income. Let us be economical of our animals by carefully feeding them, remembering that only in this way can we expect to solve any of the problems relating to the feeding of our farm stock.

THE SILO.

By Prof. G. M. Gowell.

Mr. Chairman, Gentlemen: I did not suppose that I was to do any talking here this morning; I simply came down because I could not get back to Orono and wanted to be in the good company of my associates. It was all arranged that the secretary was to talk this forenoon and Gov. Hoard this afternoon. I will say just a few words to add to what the secretary has so well said. He asked me to say something in regard to the silo.

In the first place,as to the necessity for a silo. Do you want a silo? I do not know what the condition of your farming is, but I have always had an idea that it was of a very high order, because of the lay of the land, and, as I judged, the strength and fertility of the soil, originally, and the ease with which the land can be worked. I have always thought I would like to have a farm up in this locality because of the natural advantages. I have asked two or three persons since coming here if the farmers generally had silos, and they have told me that there were but a few in the immediate locality, and I have been trying to find some reason for this. Why should we have a silo? Of course the business of the farmer is to produce crops that he may sell, and it is easy for us in any locality to raise those crops that are naturally adapted to that section. We know that there is nothing that we can raise so easily, and that grows in such perfection, as our grasses and clovers. Grass is the one crop that will take care of itself; it may give us but ordinary yields, but it does not die during the winters. When we go farther south we find that grass does not succeed. The sun is so hot that it burns it out. Clovers cannot be raised in the south, nor the coarse grasses. They are not naturally adapted to grow there. But corn is raised there to perfection. While it does not re-seed itself perhaps, still it grows almost spontaneously. And yet it is a crop that we here have to nurse along and take excellent care of in order to make it do exceedingly well. Why should we raise it? If I had a poor farm here, and I wanted to increase its stock feeding capacity, I think I should aim first at the production of grass and the clovers, simply because nature would aid me in doing this work. By the investment of a little money in commercial fertilizer, plowing shallow so as to turn down the turf, and seeding those lands to grass and clover, I could gét good crops of hay for a year or two. I believe you can add more to the stock carrying capacity of the farm with a less expenditure for fertilizer and labor by raising grass and clover than by raising other crops; and if we can produce the grasses cheaply, doing the work ourselves and being independent of this great drove of hired help, why should we not do it? But you cannot carry on commercial fertilization, by any methods that I have learned, indefinitely. It has to be combined with cattle feeding. And we learned long before we knew anything about the silo that we got better results when we fed during our long winters a certain amount of succulent food, or roots. Our animals were in better condition and we got better results when we fed a certain amount of vegetables,—turnips, beets or potatoes, than when we confined our animals to dry fodder during the winter. That applies not only to the winter, but to the whole year. We want a certain amount of succulent, green food; and since the idea has been brought out of the building of silos and the putting of a green crop,—corn or some other green crop,—into those silos, we have found it to be very practical. We have found that our animals do better than when they were confined to the dry grain and dry hay and straw rations. This is one reason why we want the silo,—because our animals do better in the long run than when fed on dry fodder exclusively. I am not going to advise you to raise corn silage, or any material, that shall be the exclusive coarse fodder of your animals, because I do not believe that to be the right thing for you to do, as you have these soils which are so well adapted to the raising of clover and the grasses, and can raise them so cheaply. But I believe you want a certain amount of silage to go with these, to aid in digestion and to keep the bowels of the animals in a healthy condition, so that the animal is able to do the best possible work and to do it with the greatest ease. I would like to have silage enough to give to every animal from the time the corn fodder and grasses, these soiling crops in the fall, were gone, until the next spring opened and the grasses started in the pasture, or until I could cut the early rye in the spring. I would like to have green fodder stored in the silo so that I could give them twenty pounds a day at least; I think that is about sufficient. It does grand good work, and we can afford that amount. Whether we can afford to feed our animals fifty or sixty pounds a day, an amount almost sufficient to carry them, is another question. At the present time, with the machinery that is available for the curing and the harvesting of the corn crop, we can raise that forage plant very cheaply, but not as cheaply, I believe, as we can raise hay. We grow the northern corn, allowing it to stand in the field until the ears are glazed. Then we cut it down and put it into the silo, ears and all. We are soon to have introduced a machine which will reduce the cost of harvesting the corn materially,—a corn harvester. The great expense connected with the corn crop is in the cutting down and drawing in of the corn. Of course with us it means $1.50 a day for our help. We study the question of the employment of help and keep that down just as low as we can. We cut our corn with the different cutters, or with a mowing machine; and we have used a machine that cuts the corn in the field as it passes along,—a machine with cutters on each side so that it cuts two rows of corn at a time. There is a machine that binds and throws off the corn, but the coarse corn is rather heavy for that machine. But there is no question but that in the course of a year or so we are going to have a machine that will cost us $75 or $100 that will cut the corn and throw it off, and cheapen very much the harvesting. The method of loading the corn on to the cart and drawing it in to the silo should be such that the men will accomplish as much as possible. Do not cut the corn down and throw it on to the ground, but just place it quickly in gavels, so that the men may lay it on to the cart in armfuls. Do not take that corn and sling it on to the cart, and then let the man who unloads it dig out an armful, but lay it on in armfuls and then you will keep those armfuls distinct so that if the man who lays the load, unloads it, he passes it off just as it was loaded on. We use our hay racks ordinarily for the hauling in of our corn silage. The man on the ground passes up an armful and the man on the rack takes that corn, top first, and lays one gavel in the corner, his next gavel below this, the third one against it, and the fourth on top, so that he has an inclined row of those armfuls of fodder. When he gets to the back end of the rack he is ready to go to the barn. He drives up to the silo and takes off the last armful first, and the load will not be all snarled up. You may say that this is foolish, but I tell you that the method by which the men do their work means a good deal. You can hire a man for $1.50 per day, and if he does as you tell him, and you tell him right, he will do a great deal more than if you just send him into the field and let him do the work in his own way. We must have system in all of these little points in order to keep the cost of production down; it must not cost us too much to harvest the corn.

How shall we keep the silage? We may build our silos in various ways. The silo should be deep, and should not have a large surface, for this reason;—when you feed off the top of the silo you do not want to uncover too large a space at once. If the surface is large and you uncover it all, the silage being a wet substance commences to decay, and if you leave that uncovered portion for a few days you have decayed fodder that would not impart a good flavor to the butter or a good odor to the stable. You want the silo very high so that the silage will be pressed together, making it solid and getting rid of the air. If this is not done it will commence to decay, and may fire-fang and burn. The silo which we built last is thirteen by fifteen feet, and it is thirty-six feet in depth. This is a pretty deep silo; twenty-five feet is a good depth. But if you use a corn cutter and an elevator you can have it thirty-six feet as well as twenty-five. If the bay of your barn is large enough to give you a silo eleven by twelve feet, this will do very well for ten cows, or a smaller size will answer; but build it just as high as you can, and start down at the bottom of the barn cellar, or away down on the ground if you have not a barn cellar. Lay your sills just as near to the ground as you can. I like to have the ribs run around the silo, because if the silo is twenty or thirty feet deep and we have upright timbers, they will spring a good deal more than short ribs running around. Put the first rib two feet above the sills, making it of two inch planks, ten inches wide. Lay these planks right above the sills and nail them together with good spikes, putting in six or eight nails and clinching them. Nail each of the corners like a cob house. Then saw off some pieces of plank two feet long and stand these up on the sill so as to lift that rib two feet above the sill. Then make another rib and lift that up in the same manner two feet above the first one, and so on up to the top of your silo. You can widen them up towards the top to three or four feet apart, because there is not so much pressure. Now you have this frame, and you simply want to board inside of that. We use hemlock boards, then put in tarred paper and reboard. Sometimes matched spruce are used, but I use simply matched hemlock that are not tongued or grooved, being careful to break joints, so as not to allow the inner board cracks to come exactly where the cracks are in the outer board. If you put the boards on in that way, while the silo may not be exactly tight it will be pretty near it. You want it as nearly air tight as you can have it. At the doors you simply leave a space that you do not board up. Make two or three doors, one down by the barn floor, and one half way up or more; when your ensilage settles, the silo will not be full. The building of a silo simply means making a box air tight, with the bottom resting right on the ground. I would simply level off the ground and put in some gravel and about two or three inches of cement. The cement will come above the edges of the boards that you board the silo with on the inside, making it practically air tight. The bottom of this silo must be above the water, so that the water will not run down and press against it, which might cause you trouble. If the bottom of your barn cellar is low, and the drainage from your manure is troublesome, you want to fill in a foot or two of rocks, perhaps, before you lay your sills. Then put on the gravel and the sills, and, after boarding, the cement, letting the cement come above the lower ends of the boards.

Now how shall you put your corn into this silo so that it will keep? We sometimes cut it in, cutting it into pieces an inch or an inch and a half long, and then, again, we put it in whole. We have filled one of our silos this year with cut fodder, and the other one with the fodder just as we brought it from the field, each man taking an armful and laying it in the silo with the butt end towards the door, and laying it as straight as possible and as close up against the sides of the silo as possible, so as to make it tight. The only trouble you will have with the wasting of the ensilage will be against the walls, and it will not generally trouble you much if you lay the corn straight, and close to the sides. Alternate the butts, but do not pack so that the leaves can come over the butts that you have laid. Tread down each armful, keeping it level, but a little higher on the sides than in the middle, so that it will settle harder on the sides. Fill it whether it rains or shines, and when you get it filled if you want to leave it for a day or two, it is all right. It is all the better if it is somewhat wet. We run the water on to our silage if it is at all dry, when we are filling the silo. When you get up to the top you can cover it with a couple of feet of swale hay or straw, wetting that down and treading it down; and if you have some old rails put them on to hold it down. The silage will commence to heat, and will warm up to 130 degrees. The process of combustion is going on,—it is getting rid of the air. All we are trying to do is to throw off the air and seal up the body of ensilage, because the air causes it to decay. As it warms up it settles down and flattens out, and all of the little air spaces in that body of corn fodder are squeezed out. It heats up to 120 or 130 degrees, and it will keep warm all winter. You can commence to feed from it when it has been in the barn perhaps two weeks,—not before that.

The way in which we feed it is this;—we take the top door down and cut a strip off from the silage about eighteen inches wide. We get what we want to feed to-day, and to-morrow we cut the next layer across, or half way across, and take it out, and so work back. We aim not to cut very deep, but to take what we want from the surface and cut frequently. We take it out in baskets in lengths of a foot or a foot and a half, and feed it in that way.

Ques. Do you hurry in filling the silo?

Ans. It is not necessary at all. It is better to be a little slow in filling it, because it warms up better. It is necessary for it to warm up in order to preserve it. If you want to put your men on to another job of work for a day or two the silage will not suffer, but it ought not to be left longer than that.

Ques. Is there any danger of getting it too warm?

Ans. I have never known silage to get too warm when it is put into the silo in the proper condition. If the corn fodder is too ripe and dry when it is put in, it will heat instead of settling down and being moist, and will fire-fang and mould, turning black, just like a heap of dry horse manure. This is why dry fodders put in loosely, without proper treading, will lose so much in value. We put in seventy tons of oats last year that were too far advanced in the ripening process. You know that the oat stalk is a hollow stalk, while the corn stalk is practically solid. Air is the agent that destroys silage, and it is the agent that we want to get rid of, and we can get rid of it much easier in the corn than in the oat plant. Had we filled that silo with those oats and allowed it to take care of itself, it would have probably all decayed, and been in the condition of fire-fanged horse manure. But as we have water works, we allowed the water to run through the inch hose all the time we were putting in the silage.

Perhaps you suppose that the silo was half full of water when we got it filled. I thought it was myself, but when I tried to tap it I could not find any water running out. The water filled those straws up and loosened the mass sufficiently so that when it commenced to settle it settled down very solidly, and those oat straws all flattened out. The air was all driven out, and we had a good mass of fodder, but we could never have had it but for the water.

But I would not advise you to put oats, or other crops than corn, into your silo very largely unless you can put them in very green, or wet them down very much. The oats should be in the milk condition, and not farther than that, the bottom beginning to turn yellow just a very little. If you have facilities for wetting them down you can carry them farther. We fed twenty-five pounds of this silage in connection with a grain ration, and we never got better results. Corn is the crop to raise for silage, and you will get from an acre of our northern corn about twelve tons, and from an acre of southern corn from fifteen to seventeen tons. But the southern corn contains a great amount of watery matter; it is a green plant and very full of water. Therefore in putting your fifteen or seventeen tons of southern corn fodder into the silo it does not mean that you are putting in any more food than when you are putting in twelve tons of northern corn.

Sweet corn fodder is excellent for silage; but it warms up a little further and becomes a little sourer, because you know that in this process of fermentation and preservation, sugar changes into the acid form, and the sweeter the corn fodder is, the sourer the ensilage becomes in the chemical process that goes on. So that silage from sweet corn is more acid.

Ques. Does this high acidity of sweet corn silage affect the product of butter and milk?

Ans. I cannot tell you positively. I have not seen anything that would indicate that it does. We have not encountered any difficulty from its use, and when fed in reasonable quantities I should not expect it to produce any effect.

Ques. Will silage of any kind affect the milk?

Ans. It will,—and it will not. It is altogether owing to the manner in which you feed it. When you open your silo your cows that were fed on silage last winter and acquired an appetite for it will throw up their heads because they get the odor and like it. If you feed those cows that have been having a hay and grain ration all of the silage they want, they will eat perhaps forty or fifty pounds; or if you feed them only twenty or twenty-five pounds a day, they are taking in a kind of food that they have not been having, and it is a different kind of food because it is a food in which considerable acidity has developed. As they are not accustomed to it, it deranges them, and as there is so much of the odor, they are not able to throw it off through the lungs, the kidneys, and the pores of the skin. They will not be able to get rid of the whole of the odor, and a certain amount of it will be thrown into the milk. But if you will begin with your cows by feeding them, each one, a handful to-day, two handfuls to-morrow, three or four quarts the next day, five or six the next day, and so on, they will gradually come into sympathy with the food and you will not get any flavor in your milk. This same thing can be done with clover. I have found some difficulty from allowing cows to go into a clover field and eat all the clover they wanted. They could not handle it all and a very disagreeable flavor was found in the milk. I have seen the flavor of milk injured, also, by feeding corn meal excessively; and you can give a cow that has not been having it, a full ration of wheat bran, and you will get a butter that will not be desirable. But with careful feeding you can feed silage or turnips without getting disagreeable flavors. The damage to the product is caused more by sudden changes from one food to another than by any peculiarity of any one food. The animal is thrown out of condition by causing her to attempt to digest an amount of food which she cannot digest, or, at least, which she cannot assimilate, and she seeks to throw it off in some way, just as an animal that is poisoned tries to throw off the poison. There are not avenues enough through which she can throw it off, and a part of it goes into the milk, and there, of course, it leaves its impress.

Ques. The secretary spoke of sowing grass seed with corn and cultivating it in. I would like to ask how deep that seed could be cultivated in and grow.

Mr. McKeen. I would answer that question by saying that it could not be cultivated in very deep. I fear I did not fully explain myself. In cultivating corn we use a light cultivator, so that really the last cultivating is simply a scratching over, covering the grass seed perhaps no deeper than you would cover it with a Breed's weeder, or brush it in with an ordinary brush harrow.

Prof. Gowell. To answer your question just try an experiment. Take a salt box and fill it with dirt so that at one end it will be even with the surface and at the other end about four inches from the top. Now sprinkle on grass seed and fill your box even full of earth, and see where the seed will come up the thickest. You will find that where it is covered about a quarter of an inch it will nearly all come up; at one inch a little less will come.

DAIRYING.

By Ex-Gov. W. D. Hoard of Wisconsin.

Mr. Chairman, Fellow Citizens: I feel like saying fellow citizens, for I am almost, you might say, a citizen of the world. Last night I ran across some old comrades of the 10th Maine Regiment. We had toughed it and marched it and fought it and struggled it together, and I felt more than ever like saying fellow citizens. Now this is a great country. A week ago last Sunday morning I was in New Orleans; I left at 9 o'clock Monday morning, and the mosquitoes came into the sleeping car so thick that night that we had to fight for what little slumber we had. At 2 o'clock the next day we came dashing into a blizzard in Chicago, and I never welcomed a snow storm and a blizzard, and all things wild and savage, with a greater equanimity of spirit than I did that day. The next thing I did was to get ready to come to Maine and give a lecture or two on my favorite topic,and to fill an engagement in connection therewith at Norway. And I received a telegram from your secretary asking me if I would talk a little to-day in a Farmers' Institute. As the fellow said when he was courting a girl and a man asked him what he was doing it for, —"There wasn't any better way of putting in my time." So I am with you to-day.

These little preliminary remarks are thrown in that we might get to a sort of an understanding. I see before me a good many grey headed men who have done their share of courting, and I see also, what is very cheerful to me, a lot of young men. Your audience looks a good deal like a Wisconsin audience. I go into Massachusetts and see old men, down into New Jersey and old men are in attendance on these little talks. I have been through these New England States for ten years, more or less, and I find a great many old men. The young men have left the farms and they are fleeing to the city. That is a sad mistake, but you know they are like the girl who wanted to go to the dance and her mother told her it was not a proper thing to do. "Oh! but," she said, "you went when you were young." "Yes, I went and saw the evil of it." "Well" the girl said, "I want to go and see the evil of it too." You may talk to the boys as much as you please, but the decay of the fine, old, God blessed, American farm home is coming. Down in Trenton, N. J., those fine old lands that used to sell for $100 to $150 an acre I can buy the pick of now at from $20 to $50 per acre. What is the matter? It is the decay, not of the American farm, but of the old type of the American farm. I remember an old man who got up in a convention and said with a pathos that was touching, "I took my farm from my father and he from his father, but my boys have gone to the city and have gone West, and mother and I cannot carry on this old farm any longer. These old arms are getting tired and I must sell the old farm. So these old farms have been pushed into the market and there were no farmers to buy them, and they have been going down, down, down, until to-day you can go there and buy one of these old farms for, you might say, but a song, and they are within sixty miles of New York and thirty miles of Philadelphia, two of the finest markets in the world. It is not the lack of an opportunity to farm profitably that ails those people. It is that the brain, the intellect, of that community has been directed away from this opportunity and not towards it. To show you that this is the case,—a friend of mine, Mr. Cook, who owned a large pottery in Trenton, a young man of about thirty with very strong rural tastes and an instinctive leaning towards the soil, his whole heart being in a farm, a splendid business man worth three-quarters of a million, sold out his entire pottery interest in 1892 and said to me, "I am going to demonstrate to these people that there is more money in modern intelligent dairy farming right here, than there is in any other business." And so he bought 1,000 acres of this old land, averaging about $40 an acre, and made a solid block of it. It was a very old farm, covered with old farm buildings such as the old New Jersey farmer would put on a farm. He wrote to me and I gave him plans for his barns and did all I could to put him right, and finally went there and straightened out this part and that part until we got the farm into good shape. And the man has put 300 cows on to the 1,000 acres of land. He could, if he chose, carry 500 cows on the 1,000 acres, and do it easily, because we have men in Wisconsin carrying 100 cows on 200 acres of land, and I know of one man who carries fifty cows on fifty acres of land. The land will very soon become fertile when you have such a wonderful fertilizing agent at work. He bought the best cows he could get and commenced producing cream for the New York market, and with the skimmed milk fattening fine pigs, making a distinctive feature of furnishing the trade in New York city with fine meats intelligently handled, like sausage, head cheese, bacon and salt pork, as there are parties in the city that are clamorous for something that is fine. He writes me that he has made sixteen per cent. on the investment. Do you know of any kind of business in these hard times which is returning sixteen per cent? Do you remember, my good friends, that a great European painter was once asked what he mixed with his colors to produce such wonderful and vivid effects, and he answered, "Brains." I am reminded of a definition that another wonderful master of olden painting was asked to give,—a definition of art in a single sentence. He gave a definition that does not apply alone to art, "The ability to see." Now let that little sentence lodge in your minds for a moment, and let me hold on to it with you. I do not want to come 1200 miles and have this a bootless errand. I do not want to leave you and feel when I turn my back that I have not done some sort of teaching to good effect. Life is too short. Work is too plenty. There must be some good thinking everywhere. The eye must see the picture, and see it clearly, or the hand will never paint it. It is so of truth. The breeder, of Jersey cattle must see the form of that coming cow clearly outlined in his mind or that cow will never come. The man who grows the corn must see in his mind the coming yield of corn, and with an eye akin to faith, like him who saw the promised land, or the hand will never bring the fruit of that labor. We have so little faith! Christ might say to us to-day in Maine and Wisconsin, concerning our work on the farm, "O! ye of little faith!"

Now, my friends, I want to talk to you a little while along some practical lines, I will not stop to generalize any more. If the farmers of Maine were living up to their opportunities, if the farmers were as big as the State is (and that is saying a good deal, I tell you) if the farmers were adequately representing the possibilities of Maine, if the farmers were as intelligent on this question as their old time Yankee origin calls for, the State of Maine would be to-day one of the most prosperous dairy states in the Union. You have a splendid climate, you have the purest of water, you have a clear, salubrious atmosphere, you have as good a grass soil as there is anywhere, you can produce good corn, you can produce good cattle. The breeder's intelligence can be just as quickly answered here as in Massachusetts or in Ohio or in Wisconsin. The problem is just the same in Maine that it is in Wisconsin. We have just as severe a climate as you have, yes, more severe, for it is almost inevitable that every winter we drop from twenty to forty degrees below zero. The question of housing and caring for dairy cattle is exactly the same, the breeding of cattle the same, and the feeding of cattle the same in every particular, except the problem of the soil. Different soils require different management, but the same problem inheres with you as with us.

I want to call your attention to a little picture in Wisconsin, in the county of Jefferson in which I live. The county is twenty-four miles square, and the soil is not the best by any means in the Rocky River Valley, but in many places rather light. There are sixteen townships in the county, with nearly 30,000 cows, with seventy-nine creameries and four cheese factories. The cows produced in that county last year in cash, over two millions of dollars. My son and myself run ten creameries in an area of about eight miles by ten, and we do not handle nearly all of the milk product. Eight hundred farmers bring us their milk every morning, and we paid out to those 800 farmers last year $340,000.00. Now footing it up on this basis, it will amount to nearly three-quarters of a million dollars, in this same area, that is secured to the farmers annually through the cow; and that does not comprehend all of the revenue of those farmers. Nearly seventy per cent. of the population are farmers.

I am beginning to doubt whether this thing we call Yankee intelligence amounts to shucks, though I am a Yankee myself. An old German once asked me what my ancestry was, and I told him I had four great grandmothers of four nationalities, Irish, Scotch, German, and New England Yankee. He said, "Vat you call dat?" I said, "That makes a Yankee." He said, "I do not tink so, I tink dat makes hash." I tell you I have a wonderful respect for the German sturdy, steady, strong grip of things. Very few of the fathers can read, but they come to us in one way and another and gain intelligence, and they are steady and enterprising and persistent. They work, and the wife works and the children work, and wealth is pouring in on those people to an extent that no American farming community in the United States that I know of is surpassing.

Let me give you another picture. The banks in that county reported to me last fall one and one-fourth millions on deposit from dairy farmers alone. And that is not all, for those old Dutchmen are suspicious of banks, and are tremendous stocking-leg investors. An old man below me bought a farm and paid for that farm $1,000 in Fort Atkinson bank notes that had been paid to him twelve years before, in the original packages. They never had seen any circulation whatever. Of course that is not the best way to do, but they are thrifty and splendid handlers of cows, and in many particulars a very prosperous people. Now there is no reason to-day why Maine should not be, in a very large degree, as prosperous as any portion of Wisconsin, in this dairy business. Nay, more; you have a great advantage. It costs me to-day to get my butter to Boston nearly double what it ought to cost you, and you have the advantage of putting the butter there within twelve hours, while it takes me three and four days to get my butter there. You have every advantage to your hand if you but see the opportunity; and I want you to see it, for I tell you, no one need have any fears about the future of this dairy farming. These great cities are coming up so rapidly that they are taking the cows off into milk production more rapidly than the cows are being added for butter production. Sixty per cent of all the milk in the United States is used for family consumption, and only forty per cent for butter and cheese. New York city reaches 350 miles westward after her milk, and is growing rapidly all the time, as are all the principal cities; and the country is not increasing, the farmers are not increasing. Everybody is afraid the dairy business is going to be overdone. My friends, let me say this to you,—it takes two years to produce a cow. You might build this whole country over with creameries, and it would not add one cow. Only half the calves are females, and it takes two years then to change the heifer over to the mother. The increase in cows annually is only about five per cent, and you can judge by that what the average increase of the country is. This increase is not sufficient to alarm any one. The low prices of the past year have come not because of over production, but because of under consumption, and the under consumption has come by virtue of the paralysis that swept over the country. I will illustrate that to you clearly. The W. D. Hoard Co., composed of myself and my three boys, furnish 4,000 families with their butter regularly every week. We manufactured last year 1,100,000 pounds of butter. We load a refrigerator car every week with this butter, and ship it to 3,000 families in Chicago, and another thousand in Cincinnati, Pittsburgh, and other cities. We have an arrangement by which it is delivered by express to each family. Now in 1892 the 3,000 families were receiving a certain amount of butter, and we were unable to manufacture sufficient to meet their demand, and had to buy $15,000 worth of butter to supply them. In 1894 the same 3,000 families left us with $16,000 worth of butter as a surplus. That made a difference of $31,000 to us in trade to the families to whom we were beholden. That difference came not from any over production, as we were simply supplying them with butter steadily. Every consumer was economizing, using less and less butter, until it made a difference to us of $31,000. The farmer, of all men on earth, ought to see with an eye single to his interest that it is to him of the most momentous character that the consumer should prosper, for if he does not prosper he will not buy his food to the extent that he otherwise would.

I will tell you another reason why you need not be afraid that this dairy business will be overdone. Darwin speaks to us of natural selection. The dairy business is a business of brains. It is a business of thought, a business of skill. And, my friends, there is no danger at the present time of over-stocking the market with brains. The farmers of our land must wake up to the fact that brains are a factor in successful modern agriculture. So many men have been taking their knowledge of farming through their hands, and because they had hard calluses on their hands have thought they ought to know all about it. The weakest man on God's green earth is a hard handed and a soft headed man. I was with the Governor General of Canada and the Countess of Aberdeen in three monster dairy meetings, and I made this same remark. The Governor General got up and reached out his hand to shake hands with me. He said, "Preach that as long as you can. It is true 'where'er the sun doth his successive journeys run.'" We need to inject into this question a larger degree of intellectuality. How shall we do this, how shall we know more about dairying? Put ourselves into the current of dairy thought. Read more, study more; let the rays of light in, do not shut them out. How can a man hope to succeed if he is not fertilizing his mind with dairy thought? We have an abundance of dairy litreature; for instance, such a book as Gurler's "American Dairying," a book that ought to be in the hands of every man who has half a dozen, or even three or four cows; a book written by one of the most successful dairy farmers in Illinois, who in the

Jersey herd of Mr. T. B. Bradford, of Golden Ridge.

winter goes down to a dairy school in Vermont and teaches the boys dairying. And we have an abundance of other literature that fertilizes the thought, the hand, and the judgment. My observation is that the difference between men in this country is not a difference in talent, but a difference in judgment. I do not care how smart a man is, if he wastes his effort it is simply like blowing smoke into the air. The man of moderate talent and far reaching judgment will discount, at any time, the man of talent and poor judgment. And we get judgment by the exercise of the reason and by the observation of facts. So many of our farmers seem to forget the uses of the mind in agricultural work. I am reminded of the story of an Irishman who was travelling through a piece of woods and found a man sunk in the quicksands. He ran over to a sort of a slow coach old Yankee and said, "Come over here as quick as you can! For the love of God, come quick!" "What is the matter?" "Come as quick as you can! Here is a man sunk in the mire!" "Is that so? Well,how far is he in?" "Begorra, sir, he is up to his ankles!" "Oh! well, he can get out if he is only in that far." "No, sir! I forgot to tell you, he has gone in the other end first." It makes a heap of difference whether a man is up to his ankles in quicksand one end first or the other. It makes a heap of difference whether a man has submerged his head or merely submerged his feet. So I say to you, good friends, that the first thing in the study of this question of dairying is to begin to fertilize the mind, to know what other men are doing, to get outside judgment, to get hold of dairy ideas and dairy principles. I have spoken in nearly all the states of the Union, and upon my word it is harder to move you people of New England to the study of dairy principles than the people in Colorado and Montana. There is so much of this conservatism that holds men back, and yet the advantage is a hundred times greater in New England, because we have larger communities and the markets are so much nearer. We have so much better facilities for the making of a fine product.

A word about this institute work. Wisconsin appropriates $12,000 annually and holds 100 institutes, and has four corps of men travelling over the state holding two day institutes.This is going on all the time. We keep the people stirred up. The institute is like a churn. You may have the best cream on earth and it does not amount to much unless you churn it. The agitation of questions inevitably brings men out. Did you ever go into a foundry where plow points are manufactured, and did you ever see how they are scoured? A great many plow points are put together, in the process, and by constant contact one grinds another. We are out on our farms and get rusty because we have not rubbed up against one another enough. We need this constant contact and attrition, and reading dairy literature is the way to get it in a large degree, if you cannot have these meetings. Every week you are brought into a dairy convention, where half a dozen or a dozen men are discussing these propositions. The men who are the largest readers of our literature are among our most successful dairymen.

I want to take up a few little topics, and first I want to take up the question of producing feed for the cow. I do not know of a single thing connected with this business, from the breeding of the thoroughbred cow down to the holding of the plow to produce her food, that I have not put my hands to, and in regard to which I am not engaged in constant study. The few years that I was beguiled from my business to go into politics and be governor of Wisconsin, I don't know whether I will ever be forgiven for or not. but that is ancient history. Before I start in on the question I will tell you a little story of Abraham Lincoln. In the dark days of '64 when he was struggling with that great burden, there came a delegation down from somewhere, full of fault-finding, but with not a word of helpful suggestion; grumbling and growling at the old man because they thought the war was not being conducted rightly. He listened patiently, and finally said, "Gentlemen, you make me think of my old friend, Jack Armstrong, down in Illinois. There came a time of deep and unfathomable mud, and he wanted a drink. It was three miles to the grocery store, but he struggled up to it, and started to go back. But between the dense darkness and the deep mud and the whiskey,he was having a terrible time to make progress. There came up amid all these difficulties a terrible, distracting thunder storm, and it was bang and crash, and crash and bang, but not much lightning. A good sharp gleam of lightning would have been a friendly thing to show him his path. Finally there came a crash that brought him to his knees, and he thought he would pray. His prayer I commend to you. 'Oh! Lord God, if it is all the same to you I would like a little more light and less noise.'" That is just the situation the farmer is in, and if I have any light to shed on this question I will stop making any more noise.

The ideas that governed the handling of the cow forty or thirty or even twenty years ago have gone by. We must have more revenue. Our lands have been decreasing in fertility, we cannot get the crops from them that we did once, and we must have more revenue, for the expenses of this modern civilization are double what they were when I was a boy. Consequently we must produce upon our farms a larger supply of cow feed. How shall we do it? First, dispossess yourselves of all prejudice and begin to study the silo. John Gould came into your state and talked the silo to you last winter, and John is a regular walking epistle, known and read of all men, concerning the silo. He came into our state and preached the silo, and the result of it was that Wisconsin to-day has between eight and ten thousand silos. There are 250 silos among the 800 patrons which I have, and the number is increasing rapidly. I suppose not more than four or five years will elapse before the whole 800 will have them. If we need a silo to make the largest amount of money, do you not need it in Maine? The summer droughts are making us tired, pasturage is becoming a very expensive thing, and we must begin to brace up and look at the question of summer soiling food. Do not think you have wasted your time on that. Suppose we could not pasture the cow at all, there is plenty of good money in dairying if we do not turn her out a single day. Just think of it! On a good average acre of Maine land I can produce fifteen tons of good, corn ensilage that is equivalent to seven tons of the best hay, which it would require four and one-half or five acres of your average soil to produce. My own cows get five pounds of hay a day. In the morning they have their ensilage and a little dry corn fodder, and at night their ensilage, and they have but five pounds of hay a day. I am not going to feed hay that is worth $10 a ton, when in my corn ensilaged am practically feeding the same value at $2 and $3 a ton. There is where this economy steps in. A great many difficulties arise on the farms in this country, and I get a great many questions; and the little "Hoard's Dairyman" devotes two pages and a half to answering questions from all over the United States. These difficulties are largely imaginary. Greeley said, "The way to resume is to resume," and that is about all we can say in answer to some of these questions.

Bless us! If we had courted our wives with as much hesitancy as we court the soil, half of us to-day would not have been blessed with wives; though I don't know but it is true with you as it is with me, that the wife had to do two-thirds of the courting. They have a silent way of doing that which is very helpful.

Another thing in regard to cow feed,—you buy enormous quantities of feed in this country. The other day I talked with the superintendent of the Grand Trunk about the immense train loads of grain that come down here from the West. You have been buying it until you have made the cost of bran double what it ought to be. Let me suggest to you, dear friends, that you go to work and study the raising of this protein feed that you buy in the form of gluten meal and cotton seed meal. Foods for cows are divided into two classes, carbohydrates, or the starchy foods, and the protein foods. The carbohydrates, you know, are the foods that produce heat, energy, and fat. I do not mean milk fat, but other fat. Milk fat is a different fat from any other fat on earth. It is a fat that nature produces for the special sustenance of the young. The cow gives milk for her baby. She is just as legitimately a mother as any other mother, but we take her baby away from her and make merchandise of her motherhood. We have, then, the protein, and the carbohydrates, the milk-making, and the meat-making, the nerve supporting, strength supporting, bone supporting food. Those foods that are rich in protein are expensive, like bran, cotton seed, gluten, pea meal, bean meal, and oil meal. And among the vegetables on your farm are vetches, peas,and clover, which are also protein foods. Now the value of a dairy food is almost invariably in proportion to the amount of protein that it contains. When you put your corn into the silo ears and all, you have in your ensilage a balanced ration of about one to ten. You need a ration that is about one to five or six; that is, one unit of protein to five or six units of carbohydrates. You need to produce this food, and I want to suggest to you that if you have any thought of dairying you begin to study the production of peas, beans, and vetches. Out in Nova Scotia I saw, a year ago last summer, field after field of vetches and oats which men were producing for cow food, for milk for the city of St. John. And those men were producing these vetches and oats with great success and getting large returns. I think there is no reason why you could not do that here. You can produce vetches and oats, but it requires a little study to produce peas rightly. Peas are no burden to the land, they increase the fertility of it just as clover does, and they also are a very important food in the production of butter. A great mistake that the average farmer makes is in plowing a piece of ground, and sowing the peas and harrowing them in. What is the result? The first rain storm that comes, there are the peas, left to whiten their bones all over the field! And the men say they cannot grow peas successfully. The pea is a very deep rooter and must be planted deep. I plant my garden peas six and eight inches deep. When I told my gardener, who is an old German, to do this,—"Mein Gott in Himmel," he said, "dey go de oder way."

Now the successful way to grow peas is to take a good early piece of ground that you can get on to very early in the spring (for peas do not suffer much from moisture), a piece not too rich but rich enough to have vigor in it, and plow it in the fall, if you choose. Then in the spring sow the peas broadcast before it is harrowed, putting on one and one-half or two bushels of peas. Then plow the ground again and turn the peas under four inches deep. You need not worry if they go five inches. They will be a little longer coming up,—but, like Tom Smith's pigs when they got into his neighbor's corn, he said he noticed they had fuller bellies when they were a little later coming home. About a week after the peas are sowed, sow on a bushel of white Schoenan oats (as this kind has a stiff straw and is a good oat) and harrow them in. You will get from twenty to thirty bushels of peas and the proper amount of oats. If you want to grow them for hay, and they are very profitable for hay, just as the peas have passed the boiling stage and the oats are in the milk, cut them down. If you wish to carry them over for grain, when ripe cut them with a mower, if you can, and put them into cocks and put some hay caps over them. Cure them in that way and put them into your barns and thresh them, and the cows will eat the straw. That pea and oat straw is the best straw on earth, it is nearly as good as poor clover hay. In that way a man can produce his protein food, and does not need to purchase anything outside, like cotton seed meal. Give me all the oats and peas I want and I will let you go with your cotton seed meal, and any other food except it be a little bran, and may be a little gluten meal; and I can sell enough of the oats and peas to buy the bran and gluten meal.

Ques. What kind of peas would you sow?

Ans. The small, yellow Canada pea. Peas are grown to a large extent in Canada for export market.

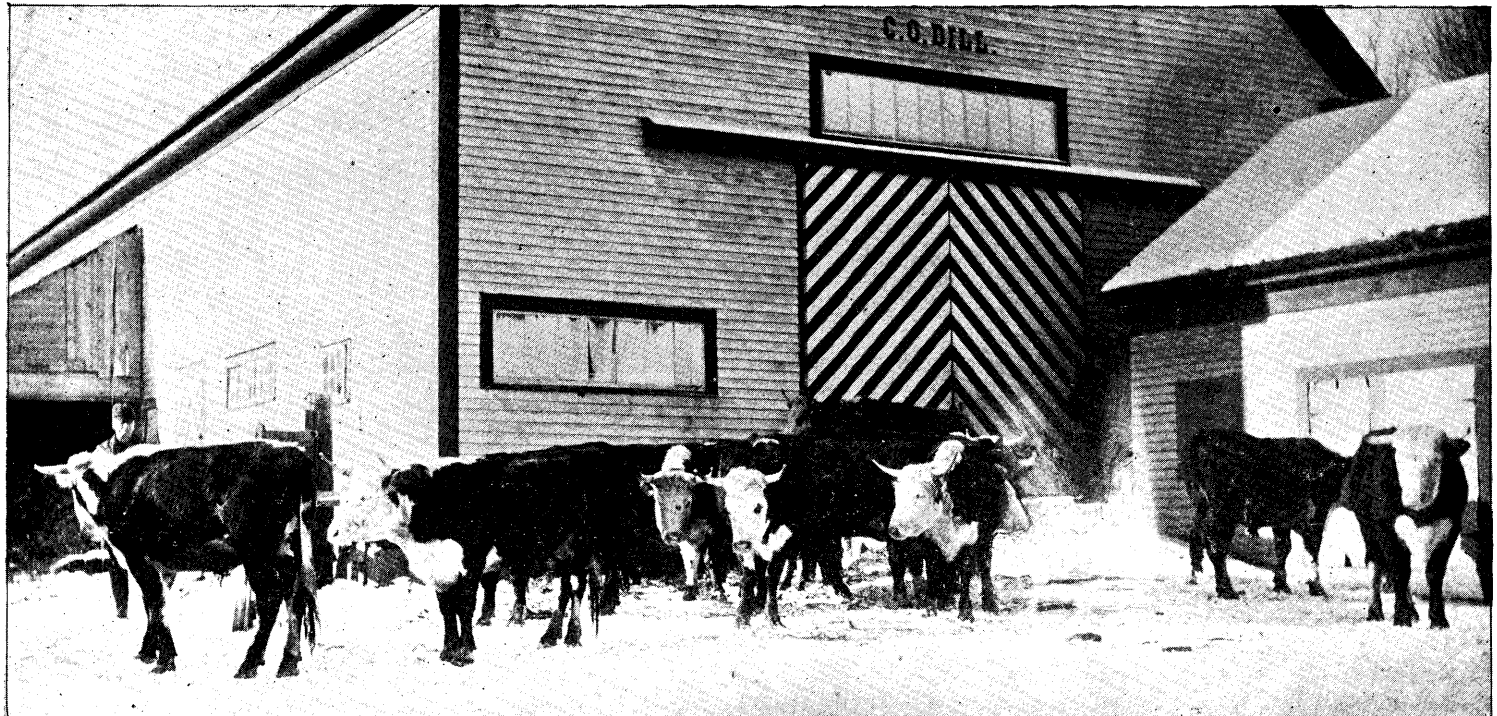
The Germans will grow that which the Yankee will despair of growing in the same neighborhood. I got them started in growing peas, and the result of it was that, while I have seen 400 carloads of bran unloaded in one year at Fort Atkinson, I will guarantee that not 100 carloads are unloaded there now, and we have a great many more cows. The farmer has learned to weave his web with more intelligence as to the warp and woof, and the result is more money in his pocket at the end. With such farms as you have in Maine I am confident that you can produce sufficient food to two and three times increase your number of cows per acre.

We hear a great deal of talk about a balanced ration. What do we mean by a balanced ration? We mean a ration that is balanced in such a way as to best promote the cow's production of the balanced food called milk. Milk is the most completely balanced of all foods. The casein or curdy part is almost pure protein, and the carbohydrates are in the milk sugar, which forms quite a large proportion of the milk solids; and we also have the fat. Average milk containing thirteen per cent solids will have four per cent fat, 3.5 per cent casein, 4.7 per cent milk sugar, and the remaining part mineral matter. If you take that proportion and feed your cows just about along that line you will give a cow about two and one-half pounds of protein, about twelve pounds of carbohydrates and five pounds digestible fibre, ash, etc. This is a good ration for a thousand pound cow. Why do we need a balanced ration? Because the cow must produce a balanced food. An old German said to me one day, "I wish you would tell me how I can feed a cow so I get plenty butter." I said, "Fritz, I do not understand you." "Well, I want to know how I shall feed dat cow so I get all de butter I can from dat cow." "Fritz," I said, "hold on! You must feed the cow to produce milk, not butter. The proportion of butter she puts into that milk will depend on the kind of cow she is. You cannot change a poor butter cow to a rich butter cow by feed. You cannot feed a Holstein and make a Jersey." "Well," he said, "I do not believe dat humbug." He thought that the feed was everything. I wanted to show him that that was a wrong idea, and I said, "Look here! You went down to the races and saw Jay Eye See trot, didn't you?" He said, "Dat was an awful little horse." "He trots a mile in 2:12 on twelve quarts of oats." That made him wonder. He said, "How can dat little horse make such awful swift time; he get no more oats dan any oder horse." "That is the speed product of twelve quarts of oats put into Jay Eye See. Understand, Fritz?" "Yaw. One mile, two minutes, twelve seconds on twelve quarts of oats when day get into Jay Eye See." "Now, Fritz you have good horses, I know, but if you should feed them ten tons of oats you could not get them a mile in five minutes." "I see! I see!" I said, "Don't you see it is the kind of horse that rules. The twelve quarts of oats put into Jay Eye See is worth a hundred times as much for speed as it would be worth put into some other horse, therefore the animal governs." If you want plenty of butter fat you must see to it that you are intelligent enough to breed the kind of a cow that will give milk rich in butter fat; then give her the right kind of feed to support that talent. We need this balanced ration because the cow must make all the constituents of the milk in order to secure the butter fat. The milk of certain cows has a much larger proportion of fat in it than that of others. That is a breed and an individual characteristic, and is endowed by heredity, and we take advantage of it and breed for it. In feeding a balanced ration we are simply conforming to the law of the cow's physiological nature, and when you hear this talk about a balanced ration, do not throw it one side and sneer at it, for it is the study of honest men who have been thinking for years; since Keene and Wolfe in Germany commenced the investigations, down to the present day.

Let us consider another proposition in dairying,—the breeding and development of the cow. "The boy is father of the man" and the heifer is mother of the cow. What the heifer is, is very largely in your hands, what she is to be is very largely in your hands. You can ruin her or you can develop her. You can almost entirely spoil her or you can encourage her. She must be well born. Old Bishop Foster said in a Methodist conference that he always noticed the grace of God flourished a great deal better in a man who was well born. It is a great deal to be well started, to be a Christian. I do not know but it is about as important that a man be born all right first, as second, but we will not canvass that. I do know that it is a very important feature in dairying that the heifer be well born. We need intelligent breeding; we want to start right with the heifer. Let us secure good blood, and then we shall have a good dairy herd. I will guarantee that there is not a boy in Cumberland county who would go out hunting foxes with a bird dog, or who would go out hunting birds with a fox hound, or who would go out to hunt either one of them with a bull dog. You cannot fool a Yankee boy with any such misappropriation of tools, but I will guarantee that there are any number of fathers of those boys who are plunging around hunting for butter with a beef animal. Now boys have sharp eyesight, boys have a keen adaption. I think a boy is one of the most practical things on earth, and sometimes the meanest. Some one has said that "a boy is the meanest thing on earth from the time you quit kissing him as a baby until you commence kissing him as a lover." But a boy has a sharp eye. I will tell you a little story that Abraham Lincoln told in Illinois in 1860. He was talking about the Democratic party's trying to ride into power, and the pro-slavery issue, but I will apply it to the boy.

A Methodist circuit rider came along to a cross road, and there stood a typical Illinois boy, with shirt bosom open, one suspender, hat all fringed out, barefooted, his pants rolled up, and with an open, frank look on his face. The minister says to him, "My boy, which of these roads will take me to Bloomington?" He was mounted on the worst looking horse that had ever trod the earth. The boy lost all thought of the question, and was busy looking at that horse. He had a shrewd eye for a horse, and could not imagine why any man of sense and intelligence would straddle such a horse to go to Bloomington, or anywhere else. The minister spoke again, and the boy waked up and said, "Who are you?" The minister said "I am a follower of the Lord." "Well," said the boy, "it don't make any difference which road you take you will never catch him with that horse!" I have just that observation to make of the man who mounts an animal entirely unfitted to his purpose. I was in the battle of Cedar Creek and I remember that wonderful scene when Sheridan came down from Winchester mounted on that horse, Rienzi, and the fortunes of that day. We were beaten back, and beaten back, and everybody was full of all manner of forebodings. We were simply going to pieces, when away back from among the stragglers, 5,000 of them, came a shout, a great roar of voices, a loud hurrah, and away in the distance could be discerned a horseman speeding down the highway and shouting "Turn back! Right about!" and swearing like a trooper. That horse had come from Winchester, twenty miles, and he was covered with dirt and foam, but there was the breeding of a thousand years in his bones, and he looked as though he would say, "Show me twenty miles more and I will make it." Just stop and think of it! What would have been the fortunes of the Union cause that day if Sheridan had bestrided a scrub? Thank God, somebody had wit enough to breed a thoroughbred horse. Did you ever know of the fate of the Union cause hanging for a moment on a scrub? But it did hang for twenty miles upon the breeding of that thoroughbred horse. And I say here that your fate, and my fate, depends upon the same degree of thought and study by which we will select our animals for our profit.

I want to say a word about the value of skimmed milk. That is another little item in dairying, and there are certain ideas in regard to it that are very important. Now skimmed milk varies in my creameries from fifteen cents to thirty-five cents per hundred pounds in value, according to the man who feeds it. Isn't that queer? Plenty of men among the 800 patrons do not make it pay over fifteen cents, and a few of them make it pay as high as thirty-five cents per hundred pounds. Everything goes by the hundred pounds with us, we cannot get percentage in any other way. When we started the Home Creamery in 1887 the farmers were very dubious and sceptical about the value of skimmed milk, and we made experiments with it that cost us $300. I will give them to you. We wanted to show those farmers just how to feed skimmed milk, and what it was worth, and we had to make a wrong experiment first, so we went to the market and bought thirty pigs, weighing about 100 pounds each. We put those pigs in a pen and fed them nothing but separator skimmed milk for fifty-six days. We paid $4.50 a hundred live weight, and sold them back at the same price, and the skimmed milk netted us twenty-two and one-half cents a hundred, fed as the fool feeds it. We did it so that the farmer should not say, I cannot do as you do. Fed in that way, at its poorest value, it is worth twenty-two and one-half cents. Then we made another experiment to show what it is worth when it is fed intelligently, according as men understand the laws of physiology. Mind you, it must be fed to young animals if you secure the best profit from it. It should be fed to pigs, and if you are going to get the largest profit from your pigs you should turn them off at 150 to 200 pounds live weight. That is what we are doing in that section. We are turning light weights and quick feeding, feeding two pigs where we used to feed one; and then we come out with a profit, with money in the pocket. So we took another lot of pigs, and paid the same money per pound, and fed those pigs a mixed ration of skimmed milk and a little corn meal. Mark the difference on account of the individuality,—that skimmed milk turned out on the second experiment to be worth twenty-seven cents to thirty-five cents per hundred pounds. The difference between twenty-seven cents and thirty-five cents was a difference in the pigs. Every one of you farmers knows that in the same litter of pigs there will be one pig that will show almost one-third more growth than some of the others. I do not know the cause of this difference. I took an ear of corn and planted the .kernels in one continuous row, starting with the kernel at the butt and going straight along, planting them ten inches apart and a single kernel in a hill, until I had the whole row of corn running one way. I did this so that I might know the relative growth of that ear of corn in different places. I could not find any difference. I found weak and shiftless kernels all the way. You know that in a field of corn some of the stalks will grow strong and rampant, and others will be weak and slender. I made up my mind that no one knows from the appearance of a kernel what its constitution and vitality are. I mention this to show you that there is an inherent power of growth and vitality, and this is true of pigs and of all animals. The planting of that corn taught me one lesson in saving seed corn,—that is, the importance of studying the stalk when I pick out my seed ear, to see to it that I have a strong stalk. In that way I have been able to make very much progress in the character of my seed corn.



Group of Hereford steers owned by Mr. C. O. Dill, of Phillips.

Now, then, with regard to those pig experiments. I want you to see these principles, and if you take them, they are like the cardinal doctrines of navigation when you are out on the ocean; a man can shut his eyes and steer by them. Of course he needs to keep his eyes open as much as possible, but they are deep underlying principles. We wanted to find out at what weight in the pig he was at his highest economic growth. Understand me, please. It is a question of weight, not age. At what weight he gave back the largest return in growth in proportion to the food consumed. We found that it was at fifty pounds. We made experiments with pigs from 20 to 300 pounds in weight, and we found, invariably, that the range of the highest economic growth was from forty to fifty pounds, not exceeding fifty. Up to fifty pounds the pig gives an increasing ratio of growth to food consumed. At fifty pounds he stops, and commences to give us a decreasing ratio of growth to food consumed, all the time on the down grade, so that at 100 pounds weight it costs ten to fifteen per cent more to make one pound of meat than it did at fifty pounds. This difference between ten and fifteen per cent is caused by the individuality of the pig, again. At 150 pounds weight, it costs from fifteen per cent to twenty-five per cent more to make one pound of growth than it did at fifty pounds, at 200 pounds weight it costs from twenty-five per cent to forty per cent more, and at 300 pounds weight it took four to four and one-half times as much food to make one pound of meat as it did at fifty pounds. Now the reason of this difference is the important part that the food of support plays. Every day as you increase the weight of the pig he takes from his food more and more to maintain that weight, because there are two propositions in the growth of the pig, holding the old growth and increasing the new growth, and both of them require food. And as you increase the weight of the pig you pass, by and by, a point where it takes more to hold the growth already made than it does to make the new growth, and you see that in steps this proposition of profit. You hear lots of farmers say, "When my pig weighs 300 pounds I will sell him." Suppose he weighs 299 pounds and you say, "When he strikes that other pound I will sell him." You have to feed him food enough every day to support the 299 pounds or he drops back to 298. Just how much is that food of support? It is about two per cent each day of the live weight. You can see that two per cent of fifty pounds is a very small amount, but two per cent of 300 pounds is six pounds of food a day. So you see that if you would get the largest profit from skimmed milk you must feed it to young animals. And it invariably should be fed warm. With calves, feed the skimmed milk just as the baby calf takes milk from its own mother,—feed it frequently and feed it warm. With a pig you need not be quite so particular about feeding it warm, but pigs will thrive better on warm, sweet milk than on sour milk. Feed it to your pigs in proportion to their age. Make quick growth and fatten more pigs, and you will make your skimmed milk worth all the way from twenty-five cents to forty cents a hundred pounds.

To be a successful dairyman a man must be a breeder, he must understand how to produce the right kind of a cow; he must be a skillful feeder, and he must also be a skillful producer of food; and he must know how to handle the by-product; and lastly he must also, if he is not a creamery man but a private dairyman(and if he is a creamery man he can do better because of this) use commercial skill in selling. Let me suggest to you that a large proportion of the poor butter that finds its way into the New York and Boston markets comes from individual farmers who make a little butter and take it to the cross roads, and swap it for calico or molasses, or whatever they can get; and the store-keeper doesn't dare tell Mrs. Jones that her butter is not as good as Mrs. Johnson's, or she will get mad in a minute; for a woman will get mad about her butter or her baby quicker than in any other way. She will stand ten times as much about her husband, but he is not the product of her own industry. Sell your butter in the butter market. If you were selling goose feathers would you sell them in a cast iron market? Now remember one thing,—the butter market does not pay for hard labor. It doesn't make any difference if your butter cost you $1.00 a pound, you cannot get pay for hard labor; but you can get pay for skill. The butter market pays for skill and intelligence. So you must be skillful in reducing the cost of production, and skillful in selling. It is much better for you to send your butter to a market like Boston, selecting a good, intelligent commission man; and if you are careful, and use skill in the production, you will be well treated. I send butter to New York, Boston and Philadelphia, and I have no complaint to make. They use me fairly and squarely. I saw the time in Jefferson county when there were 1500 farmers sending their butter by express to Chicago and Pittsburg, and that was one of the things that lifted our farmers up where they could see the judgment of the market. If you want a good object lesson, send to some of those people who make first class butter and buy a little package, and study it and taste it, and taste it and study it, until you get that look, flavor and texture in your mind, and that will be worth to you more than ten times its cost, in the future production of your butter.

Mr. McKeen. I learn since coming here that quite a good number of the farmers have excellent private routes where they are selling butter and getting a good price, and it is probable that some questions might be asked which would bring out facts in relation to that method of conducting the dairy business.

Mr. Vinton. In order to do a successful business in farming we should not go on keeping two or three cows year after year. In many places we want to get rid of our land, but all around here it is exactly the reverse,—the farmers cannot get the land that they want. Now how can these farmers, who would be glad to have twice as much land, best double the number of their cows?

Ans. I indicated it, Mr. Vinton, at the beginning. I think they could do this by the use of the silo, and by increasing the amount of food that is produced on the farm in a different way from the old way. You have no idea, until you try it, of the tremendous amount of food that can be produced on an acre by raising corn and putting it into the silo. If you cut your corn and dry it you can readily perceive that while you can produce more food than you can with hay, you do not begin to get the sustaining power that there is in the corn fodder. I will illustrate it to you by a little experiment. I wanted to determine how much croppage a cow would eat when she was grazing. This experiment will show you the wonderful sustaining power of succulent food over dry food. No one had ever found out how many pounds of grass a cow took when she grazed two and one-half inch cropping. I hunted through the French, German and English works but could not find out. So I took a 1000 pound three-quarters Jersey cow and put her in the barn, and set my man at work with my lawn mower, on my lawn and several other lawns. I took two and one-half inch croppage, weighed it and fed the cow all she would eat, and she ate eighty pounds a day of that kind of grass. At the same time I dried thoroughly a corresponding amount and put it one side. The eighty pounds, dried, amounted to twelve and one-half pounds. I continued this for one week. Now the cow would eat this two and one-half inch croppage and give me one and one-half pounds of butter a day. Then in the next seven days I fed her this twelve and one-half pounds of dry food, each day, and she commenced to shrink in her milk. What was there in that sixty-seven and one-half pounds that went out of that eighty pounds. Everybody says "Water." Yes, but it is a different kind of water, it is not well water. In drying the feed, I have no doubt that I dried out a large amount of its nutritive power. There is not a man here but would take a nice Mother apple and eat it with great relish; but if you should take that apple and dry it how many of them would eat it? Do you believe it has the nutritive power in it? That is the point with ensilage. When we come to the practical feeding test men will stand outside and figure on it just as the old fellow undertook to figure how deep the swimming hole was by standing off ten rods. The little boy said, "You never can find out till you wade in." When you take ensilage, and subject it to the feeding test, you will find that an acre of corn will support a large number of cows. In addition to the winter silo, we are coming to have a silo built for summer use, when the pasturage fails, and we have to feed our cows some kind of food. We are beginning to fill our silos in the fall for the next summer. These are the latter day economies in dairying, whereby we make this smaller number of acres carry more cows.

Ques. What do you mean by the summer silo? Do you fill it at the usual time in the fall and let it remain untouched until the next summer?

Ans. Yes, sir. It will keep almost eternally. I have seen ordinary silos left unopened for three years, and when the ensilage was taken out it was as sound and sweet as a nut.

Ques. What kind of grain is vetch?

Ans. Something like a pea; it belongs to the pea family. Peas, beans and vetches belong to a family called legumes; they have the property of absorbing nitrogen from the air and transforming it over into the soil and enriching the soil. The vetches, pod all the way down and have a little stronger stalk than peas, and stand up a little better.

Ques. For these farmers who buy grain, what is the best grain to buy to feed Jersey cows?

Ans. I think if it were my case I would buy wheat bran and gluten feed. I am feeding gluten feed myself, and it is producing good results. There is a difference between glutn feed and gluten meal; gluten feed is the cheaper. These glucose works, when they work up the starchy part, can do nothing with the bran or the chit. This is ground and a little refuse glucose mixed with it and called gluten feed. There is a finer, higher grade called gluten meal.

Ques. Do you think cotton seed injurious to the health of the cow?

Ans. I think not, if it is properly fed. I am very fond of cotton seed, but I have never allowed myself to feed over two pounds a day. I would rather make up with something else, and not feed so heavily on one thing; and I notice that my cows' digestion is always strong. The old German who feeds my cows is valuable to me because of his watchful eye. He knows the condition of the cows as quick as a flash, and will tell me all about them. Sometimes he will say, "That cow, she kind of got her nose up in the air; she not like something." He is a very funny old fellow. Last summer I told him that I heard they had so much rain in Maine and New Hampshire that they could not make hay. We were having a terrible drought. "Oh!" he says, "This country getting so big, God Almighty, he don't attend to it." Cotton seed meal is a splendid feed for two purposes,—it contains a large amount of protein, and it gives you a hard, solid body in butter; while gluten seems to soften the butter. It is well to remember this,—that a little cotton seed with the gluten or bran will help to harden butter; corn meal also has a tendency to harden the butter, but gluten seems to make it a little softer. A mixed ration containing a little cotton seed fed with ensilage is a very good feed. You will find, when you are feeding ensilage, that the cream churns easily and churns exhaustively. Every good housewife knows how much quicker the butter comes when the cows go on to grass, the first of June. It is just so with ensilage, as it is a succulent food.

Ques. What are the relative merits of the separator and the Cooley Creamer?

Ans. If I had eight of ten cows, or about that number, I would put in a separator, and I will tell you why. I presume I have tested more than one thousand samples of skimmed milk, as I have been going about the State in institute work. The farmers will bring to me cream and skimmed milk and ask me to test it, as they have no Babcock test, which every man ought to have. You might as well undertake to sail the ocean without a compass as to run a dairy without a Babcock test. It is one of the grandest things in the world. I have found almost invariably that milk from cold setting would contain from four-tenths per cent to one per cent of butter fat. Now one per cent of butter fat means one pound of butter in every hundred pounds of the skimmed milk. The separator wrenches out the butter fat, it cannot escape. With a good separator, the per cent of fat left in the skimmed milk is down to one-half of one-tenth per cent. Suppose you buy a separator at $125. The interest on that at six per cent is $7.50 per year; and the saving in butter will pay the interest as a rule, with the milk of ten cows, and give you a handsome sinking fund which will pay for the machine in five years.

Ques. Is the hand separator any good?

Ans. It is not good for us to turn, but it does just as good work, the quality of the butter is just as good. The slickest way to do that I know of is to make a little room along side the barn and buy one of these little tread powers and make the bull do the work. Put the bull into that tread power and say to him, "Do works meet for repentance," and it will do him a lot of good, it will chasten his spirit. Every woman knows that when the old man is right hard at work he is not half as cross and snappish. When he has nothing to do he gets surly, and no matter what she does she cannot please him. The masculine element is very much alike, whether you find it in cattle or men. It is standing still in the barn with nothing to do that makes the animal ugly. Dr. Bowen of Woodstock has a cart and harness and makes the bull do a great deal of work. If you have a tread power and a separator, it is a great saving to the work of the women. Making butter in the crude, old fashioned way is quite a trial to the wife. I know just what it is; I have done every bit of it from the butter-making to the cleaning of all the utensils.

Ques. What make of separator do you use?

Ans. We use nothing but creamery separators. We have the United States, the Russian and others.

Ques. Is the United States as good as any?

Ans. I do not see any particular difference in the quality of their work.

Ques. In raising a heifer calf does it pay to let that calf stop growing?

Ans. Oh, no! I think the calf should be kept thriving until she gives milk. I feed my calves on skimmed milk until they are three months old, and my heifer calves until they are six months old, if I have the skimmed milk to give them. Skimmed milk is a very valuable product. The finest time of the year to rear a calf is to have it come in the fall. Then you have the winter milk and by the time the calf is six months old he has some show for himself; and he does lots better than the calf that strikes this fly time, and doesn't know what to make of things anyway.

Ques. You say you feed the calf skimmed milk until she is six months old; what do you give her then?

Ans. My favorite feed for calves is oats, with a little bran. I keep the calf growing just as fast as I can without fleshing her.

Ques. What do you think about giving milk to milch cows?

Ans. I have never tried it myself, but I know of a number of men who have fed skimmed milk to their cows, and they claim that they can find no more profitable feed than this; there are no bad effects.

Ques. Does it pay better to feed skimmed milk to hogs than to cows?

Ans. That would depend on the price of the product.

Ques. Did I understand you to say that no matter what you gave a cow her milk was no richer?

Ans. What I said was that the character of the milk is determined by the cow; that is, the individuality of the cow. It does make a difference as to the amount she will give in the course of a year whether you handle her well or not. But the relative proportion of fat in the milk is determined by the individual character of the cow.

Ques. For instance, if you are giving a cow bran and hay and she is giving four quarts of milk, and then if you give her in addition a pound of cotton seed and gluten which will increase the quantity of milk to six quarts, isn't that six quarts of milk any richer than the four quarts?

Ans. When it is tested by the Babcock test there is scarcely any difference. If a cow is below her natural limit she will come up to that; otherwise there is not much change. This is a very hard question to discuss, and I never discuss it but that I leave people with a good deal of misunderstanding.

DISEASES OF OUR DOMESTIC ANIMALS.

By Dr. F. L. RUSSELL, Veterinarian at Maine State College.

In discussing so broad a subject within the narrow limits of time that can be allowed us, it will be impossible to go very much into the details of particular diseases. We can only speak in general terms. We shall be obliged to limit ourselves to the statement of well established facts, and avoid doubtful theories. Probably most of you have been losers from some particular disease, and the discussion of that disease would particularly interest you; and we might profitably use all the time at our command in considering any one of many different diseases. But we must claim your considerate attention while we take a general view of the diseases of our domestic animals, and afterwards, if there be time, we can consider more in detail the particular questions you would like some light upon. Not that I will agree to answer any questions that you may ask, but I will do so as far as I know, and shall be glad to receive light where I am ignorant.

Why is it that our domestic animals are at times diseased? A condition of health is the natural and prevailing condition, and disease the exception that calls for an explanation. One has rather sneeringly and unthinkingly said, "It is a pity that only disease is catching, and not health." We would remind you that nothing is more universally catching than health. It is not only the birthright of every living thing, but it is the direct result of the natural and instinctive use of universally distributed means. Health is caught from pure air, water, sunshine and rain, from the food we eat and the exercise we take. It is not for a privileged few, but it comes unsought, and often unappreciated, to the many.

When health is absent we look for a cause outside the natural and general order of things. Ignorance of, or wilful disregard of, natural law, will account for most of the diseases of thinking beings. But lower animals obey natural laws naturally and instinctively, and yet it is a familiar fact that they sometimes suffer from disease. Why is it? To change slightly a familiar and generally recognized truth, the sins of the fathers are visited upon their beasts of burden, their cattle and all living things that are subject to them. Man's interference with natural condition, in other words domestication, with all that that implies, furnishes the answer to the question. Why do animals suffer from disease? If this is not the only answer it is certainly the most important one.

We will group the thoughts we have to express under four general heads, the cause, recognition, prevention, and treatment of disease.

That we may start with a fair understanding of what is covered by our subject we must first consider what we mean by disease. To state it briefly, disease is any deviation from health. In health, each organ of the body is in perfect adjustment to perform the work required of it. There is no friction. The machinery runs smoothly. Breathing is involunatry and painless, digestion is normal and complete, locomotion is easy and without conscious effort, and the blood circulates to every part, restoring the waste and maintaining an even temperature. Every ounce of food eaten is converted into vital force. In such a condition existence is a pleasure. But let any organ be in the slightest degree out of adjustment, and fail, in the least, to perform its true office, and we have disease. To discover the slightest deviation from health, promptly, often means the avoidance of more serious conditions.

All the causes of disease may be included under three heads, viz:—common, predisposing, and specific.With the common causes we are all more or less familiar, and many times, perhaps, attribute to them results with which they have nothing to do, or with which they play but a secondary part. Some of these common causes are exposure to cold and wet, exposure to wind when heated, lack of exercise, irregular exercise, lack of food, poor food, too much food, too rich food, suddn changes in the quantity and quality of food. These and many other similar causes have always been held responsible for most of the ills that our domestic animals suffer from. When there is no other evident reason,it is easy to say the animal has taken cold, although just what that means is not always clear. When the evident result immediately follows the cause we call it an accident, as when from carelessness or unavoidable means a horse is cut or lamed. We call these things that we have mentioned common causes of disease because of their tendency. They may act singly, or several of them together, and may cause different diseases in different animals. Do not mistake me now. We do not say that exposure, lack of exercise, overwork or injudicious feeding always result in evident disease, but simply that they tend in that direction and not in the direction of health. Strictly speaking they always produce disease, or in other words, in some degree interfere with the perfect adjustment of the physical system. What does not promote health, promotes disease. If the exposure is sufficiently severe, the lack of exercise or overwork sufficiently prolonged, the injudicious giving or withholding of food extreme, sickness or even death must result.

What do we understand by a predisposing cause of disease? Perhaps we can make our meaning plain by one or two illustrations. Two cows are having the same feed and care. If they are exposed to storms, they are exposed alike. If their feed is not the most suitable, one has no advantage over the other in this respect. If they are milked by an unskillful milker, he treats them both alike. Yet one of them is almost spoiled by an attack of garget, inflammation of the udder, while the other is entirely free from this trouble.

Again, we have two horses working side by side in the same team, driven and cared for by the same man. They are equal in age, size, and disposition. Yet one early develops big bone spavins, and the other continues to old age with legs as smooth as a colt. Now, whatever was the active agent in producing garget in the one case and spavin in the other, we would say that predisposition, either inherited or acquired, had much to do with it. We say that a horse with round, crooked hocks is predisposed to spavins, and a cow with a largely developed udder, or one that has suffered from many previous attacks, is predisposed to garget. Predisposition is either inherited or acquired. When inherited, it manifests itself in the form or constitution of the animal. When acquired, it is the result of previous disease or abnormal development of some organ. Because an animal is predisposed to some disease it does not necessarily follow that it will ever suffer from that disease. The horse with weak hocks may be so carefully handled as to remain sound to old age, and the gargety cow may be so well cared for as to never have another attack. Predisposition means a weak spot somewhere that needs guarding, and nearly every animal has some weak spot, or rather, is less strong in some particular than in others. Very few animals are constituted like the "Wonderful One Hoss Shay." It is at these weaker spots that the animal is likely to yield when subjected to unfavorbale conditions, such as exposure and injudicious exercise and feeding. On account of age, or previous disease, an animal may at one time be predisposed to a certain disease and not at another. Thus, until it is healed, a broken rib will predispose an animal to pleurisy and pneumonia. Pneumonia in horses predisposes to laminitis, inflammation of the feet, and young horses are predisposed to strangles. To know at what point disease is most likely to attack our animals will enable us to use such precautions as to preserve them in health, and not to waste our efforts in directions where it will do no good. You have a cow that never gives more than ten quarts a day of rather poor milk; there would be no sense in using exra precautions to guard her from milk fever, for such a cow never has milk fever. But if we have a mature cow in good flesh that is an extra large milker, it is important that we use every reasonable precaution to guard her from milk fever, for she is predisposed to it. Predisposition alone never produces disease. It is not an active cause, but rather furnishes an open door where disease may find an entrance, and it is at open doors that we must set a guard.

Specific causes of disease include animal and vegetable parasites, such as lice, ticks, glanders bacillus, tubercle bacillus, hay cholera bacillus, etc. While common causes may produce different diseases in different animals according as they are differently predisposed, specific causes always produce the same diseases in different animals. The tubercle bacillus never produces any other disease than tuberculosis, or the glanders bacillus than glanders. These are active agents of disease and may produce their results independently of all other causes, provided they actually come in contact with susceptible animals. But anything that lowers the vital forces of animals renders it easier for these specific causes to gain a foot-hold. Some infectious diseases,animals seldom have a second time. Among these are strangles, from which most horses suffer before they are five years old, and influenza, which was epidemic among horses all over the country in 1871 and 1872. These diseases are seldom fatal, and a horse that has had either of them and made a good recovery is more valuable than though it were still liable to have it. All animals do not seem to possess the same susceptibility to specific diseases. Under the same exposure some are affected and others escape. We do not know what acuses this difference,but there must be some difference in the constitution of the animals themselves that accounts for it.

How do we recognize disease in animals? Sometimes this is not a very easy thing to do. If we are sick we can usually tell our physician where it hurts us, and thus help him to an understanding of our condition. Although our dumb friends cannot speak they often have a language more eloquent and expressive than speech, whereby they make their condition known. Imagination does not magnify or distort their troubles in any such degree as it does ours, and there is nothing conventional in their method of expression. Their language is the natural expression of their feelings. If they are suffering pain they give unmistakable evidence of it, and in many instances one has but to observe them closely to exactly locate the trouble. But if the pain is temporarily relieved, they may give no sign to indicate their real condition. There is much that enters into the recognition of disease in animals that cannot be readily expressed. It comes from familiarity with diseased conditions and close observation. The first necessity for the ready detection of disease is perfect knowledge of the animal in health. The man who disposed of his sheep because he discovered that they had lost all their upper teeth illustrated this need, and such a man exists in this State in the person of a fairly intelligent farmer past middle age. Did we not know that cattle are accustomed, even obliged, to chew their cud in health, we would attach no importance to their failing to chew the cud, although this is one of the most common and suggestive symptoms of disease in cattle. Did we not know that animals in health seek the society of their kind, it would mean nothing to us to see them seek solitude.

First then, know the healthy animal. Make him a study. Seek to understand the reason for everything he does. Be familiar with him in motion and at rest, while he is at work and at play, while he is eating and sleeping. Notice the peculiarities of his form, his disposition and individual taste. When thus familar with the well animal you will be prepared to detect the first symptoms of disease, and to use means for speedy relief. The merest novice, with no interest in animals, can tell that one is sick when it is just ready to die. But such tardy knowledge is of no value. If you do not notice that your cow is sick until she is so far gone with milk fever that she is down and unable to rise or swallow, you may as well look for a place to bury her, for that will be the next need. Yet she may reach this condition in a few hours after she is in apparent good health. If you do not discover that your horse is lame until he has a bone spavin that is very evident to the sight, it is useless trying to make a sound horse of him. But there was a time when a few days rest might have affected a perfect cure. As already indicated, a sick animal will make known his condition by a change in his habits, and the nature of the change will often clearly indicate the seat of the trouble. Loss of appetite, disinclination to move, lack of usual good spirits, and indifference to what usually attracts attention, are general symptoms of disease, and indicate that the animal is sick. Profuse sweating and constant moving about, often with violence, indicate severe pain. The location of lameness is often indicated by the position in which the affected leg is held at rest, and carried when in motion. A spavined horse will be most lame when first started, while a horse with injured tendons often starts quite sound and becomes very lame after a little driving. Ruminants with any digestion trouble do not chew the cud, and lie down or stand persistently, showing decided indisposition to move. A cough and discharge from the nose indicate disease in some part of the respiratory tract. The double movement of the flanks in expiration is an unmistakable sign of the heaves. The hot prominent swelling of the lymphatic glands in the intermaxillary space is the characteristic sign of strangles. Each disease has it peculiar symptoms, if you are only able to detect them. Recovery from some diseases is never complete. Enduring marks are left to tell the story. Prevention of disease is much more important than the treatment. It usually costs less and is more successful. This is particularly the age of preventative treatment in medicine. Instead of looking upon disease as a mysterious manifestation of Divine Providence as inevitable as the movement of the planets and the change of seasons, we have come to see that sickness is usually caused by agencies under our immediate control. We look into the reason of things,and find at our very doors and underneath our own hands the means of avoiding what have been regarded as inevitable decrees of Divine Providence. If colts produced from much prized family mares somewhat past the period of their greatest usefulness on account of age, heaves, and spavins, fail to meet our highest expectation, we look for the reason in the manifestation of the general law that "like begets like," a law that applies as well to what we don't like as to what we do. We cannot control the blowing of the wind or the falling of the rain, but we can protect our stock from undue exposure to either. We can feed so regularly and well, adapting the feed to the varying needs of the growing heifers and colts, the cow in milk and the horses at work, that all shall be in a measure fortified against the inroads of disease. Let me tell you a trade secret. If every one took good care of his stock as some do, half the veterinary surgeons in the country would have to go out of the business or starve. This taking good care means much. It does not consist in giving an abundance of food and water at regular intervals, regardless of the varying needs of the animal. To give a horse that is idle the same feed upon which he will thrive when he is at work is to invite disease. Probably more horses in this part of the country are sick and die as a direct result of overfeeding than from any other cause, not excepting old age. A horse that is doing regular work is not so likely to suffer from overfeeding, although many of these would work easier and thrive better with less; but idleness and overfeeding are positively dangerous.

One class of diseases that are entirely preventable is that due to specific causes, infectious diseases. But these are only preventable through the general adoption of effective means. It is not enough for me to suppress tuberculosis and glanders among my own stock. If my neighbors fail to do the same I am liable to suffer from their neglect. But it is within the power of each individual to guard himself from loss from such diseases as colic and heaves in horses, milk fever and garget in cows, and scours in calves. These diseases are due to exposure and unwise feeding, chiefly the latter. Therefore care in avoiding the cause, for which we are responsible, may be relied upon to prevent the effect.

But I must pass to the consideration of the curative treatment of disease. In this connection the first point to decide is whether treatment is worth while. It is true that sentiment plays some part in our care for sick animals, but so long as the primary object in keeping domestic animals, particularly on the farm, is the profit to be derived from them, the first question to be asked in regard to any sick animal is, Will it pay to attempt a cure? This is not always an easy question to answer, and mistakes will inevitably be made. But doubtless they are more often made on the side of attempted treatment than on the other side. We are apt to endow with a fictitious value an animal that has long been prized, although the elements that rendered him valuable to us no longer exist. And again, a sanguine disposition is liable to magnify the chances of recovery so that an unreasonable amount of time and money is expended in treating sick animals that can never repay the expense incurred. It is not good economy to spend ten dollars to cure a five dollar horse that may die in spite of all that we can do. Neither is it wise to make much of an effort to save the life of an animal that can never be of use again, unless you value it as a friend, and not simply for its utility.

Again, such infectious diseases as glanders and tuberculosis ought never to be treated, for while it is possible that now and then a case might recover, the risk of conveying a fatal disease to other animals and perhaps to human beings is too great to be safely incurred. All animals afflicted with these diseases should be killed and either burned or deeply buried as soon as the nature of the trouble is known. Other infectious diseases, that are not usually fatal or communicated to man, must be allowed to run their regular course. No treatment will have much tendency to hasten recovery. All that can be done is to keep up the strength and courage of the animals by good care until the disease runs its course. In any case where it is worth while to attempt treatment and it is safe to do so, no time should be lost in getting about it. A slight difficulty, by neglect, may become a serious matter. On the other hand it is not well to adopt rigorous measures without due consideration. A little good nursing at the onset of disease may be effective when the highest skill will not avail at a later stage. Be sure you are right and then go ahead, but do not go further than you know. In the giving of medicine it is a safe rule to give it only when you know what you are giving it for, and the probable effects. There is little doubt that more cattle die from overdosing than from lack of medicine. It is not easy to stand by and see a valued animal suffer, and do nothing to relieve it. But when the anxiety to do something leads you to give medicine with a vague hope that it may meet the needs of your patient, you are treading on dangerous ground. Recovery may follow in spite of your ill directed efforts, but it will be no thanks to you. Medicine is sometimes needed and is even essential to tide over some emergency, but such times are not suited to experimenting with the medicines that may be at hand or recommended by some sympathizing friend. Better by far do nothing than to do something that had better not have been done. There is, however, a line of treatment that it is always safe to follow, and in most instances it is of more importance than the giving of medicine. Good nursing is always in order. Without the intervention of drugs, nature will often bring about recovery from serious disorder, when she has a fair chance. By good nursing, I mean anything that adds to the comfort of the patient and tends to sustain the vital forces. If appetite is lacking in long continued sickness, seek to stimulate by tempting food, that strength may be maintained. Water in small quantities, but often enough to satisfy thirst, may nearly always be given with advantage. In summer it can be given cold, and in the winter, warm it. Suit the comfort of the patient. Pure air, warm clothing if needed, and dry comfortable quarters, are always in order. Study the needs of each individual case, and many ways of administering to its comfort will suggest themselves. It is allowable to give full vent to sympathy and relieve anxiety as completely as possible in efforts to make your patient more comfortable, provided your efforts accomplish their object. Do not fuss and work over an animal that would be better if left alone, and yet spare no effort to add to its comfort. We may be justified in taking the life of our dumb beasts to end their sufferings, but have no right to leave them to suffer when we can relieve them.

CATTLE COMMISSIONERS' REPORT.

We append a full abstract of the cattle report for the year closing December 31, 1895.

A summary of the business of the year will show that the Commissioners made two hundred and twenty-eight inspections of horses and cattle during the year just closed, scattered all over the State from Kittery to the Aroostook, and from the mountains to the sea. This number of inspections is largely in excess of any previous year, and while the total number of animals condemned is approximately the same, the demands upon the board for inspections have increased out of all proportion to the annual amount of appropriation heretofore made to carry on the work, and which must be increased if the same vigilance and control of the contagious diseases of horses and cattle in this State is to be exercised in the future as in the past.

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 $2459, the total amount of appraisals for the year being $4,386.

The number of horses found to be affected with glanders is twenty-one less than in 1894, while the number of cattle affected with tuberculosis is twenty-three more, which represents almost the exact number found in the two herds at New Gloucester, which were discovered towards the very latter part of the year, and where in each instance the disease could be clearly traced to the introduction of new animals from herds in which diseased animals had previously been found and destroyed by the Cattle Commissioners.

Our quarantine against Massachusetts is still in force and was supplemented on November 12, 1895, by another much more sweeping in its provisions, and which had become absolutely necessary, not only to provide against cattle from Massachusetts coming here in violation of our quarantine regulations, (which had occurred in several instances,) but also to prevent whole droves and car loads of cattle coming into Maine from other infected states, without any permit, or without having been submitted to tuberculin tests, which latter requirement has since been adopted and agreed to by all the boards of Cattle Commissioners of the New England states, in convention at Providence, R. I., November 20 to 23, 1895.

The interstate regulation then agreed upon, provides: All cattle transported from one state to another, shall have first been tested with tuberculin by some graduate of veterinary surgery and medicine, and upon the receipt of such proof sheets as are satisfactory to the state boards, a permit is granted to the owner and no delay is then caused in shipping such animals to their destination. The permit thus granted accompanies the way-bill from the point of shipment, and unless such a permit is furnished to the railroad or steamboat agent, no cattle will in future be accepted for transportation. It will be seen by reference to section 7, chapter 177, of the Maine law, that such transportation companies are held responsible for all such shipments. Section seven is as follows:

SECT. 7. That no person or persons owning or operating any railroad, nor the owner or owners, or masters, of any steam, sailing, or other vessels, within the state, shall receive for transportation, or transport from one part of the state to another part of the state, or to bring from any other state or foreign country any animals affected with any of the diseases named in section two of this act, or that have been exposed to such diseases, especially the disease known as tuberculosis, knowing such animals to be affected, or to have been so exposed: nor shall any person or persons, company or corporation, deliver for such transportation to any railroad company, or to the master or owner of any vessel, any animals, knowing them to be affected with, or to have been exposed to, any of said diseases; nor shall any person or persons, company or corporation, drive on foot, or transport in private conveyance, from one part of the state to another part of the state, any animal, knowing the same to be affected with, or to have been exposed to, any of said diseases. Any person or persons violating the provisions of this section, shall be deemed guitly of a misdemeanor, and upon conviction thereof shall be punished by fine not exceeding the sum of two hundred dollars, or by imprisonment not exceeding six months, or by both fine and imprisonment.

As regards our first quarantine against Massachusetts, a few shipments of milch cows have been made from that state, that owing to some carelessness or lack of proper instructions upon the part of some owner or agent, have arrived in Maine without such permit, have been received by the Maine Central road only to be promptly sidetracked at the quarantine stations at Westbrook Junction, to be held at owners' expense until it could be proved they were not diseased, and afterwards forwarded to their destination.

The case referred to in our biennial report of 1894, where three cows came from Beverly, Mass., without any permit and were tested by our board, and one of them, found to be badly diseased, was destroyed without compensation to the owner, has found its counterpart during the past year in another cow shipped July 2d from Lawrence, Mass., en route for Ellsworth, Me. No permit accompanied this case, and she was held in quarantine until the owner could be notified, and after he had been found and absolutely refused to comply with our State law, the cow was tested with tuberculin and proved to be diseased, and on July 30th she was destroyed, the post mortem disclosing an advanced stage of pulmonary tuberculosis.

We are constantly in receipt of letters asking for information in regard to bringing cattle into Maine, (chiefly for breeding purposes) and it will be necessary in the future to have all such cattle properly tested with tuberculin and the proof of such tests furnished some member of our board,*when, if approved*, a permit will be granted to the owner, which will insure his cattle not only to be acepted by the transportation agent of any company whose terminus is Maine, but will ensure no detention while en route to their destination. A single case in point will fully illustrate the importance of such requirement.

A gentleman owing a prominent herd of thoroughbred cattle in this State, recently selected six head of high priced cows in Connecticut to increase his herd, and applied for information as to how he could have them shipped to Maine. He was told that the only way he could obtain a permit was to have the cows tested with tuberculin before concluding his purchase, and if they *stood the test*, such a permit would be granted. But, says he, suppose the owner refuses to have them tested? We replied, then don't buy them. The result was that the cows were submitted to the test, *and every one of them reacted*, thus saving the gentleman from buying diseased stock, and the State receiving any more diseased cattle.

In regard to our late quarantine of cattle from any point of the compass, it had come to the knowledge of our board that several droves and car loads of cheap cows were being brought into Maine along the line of the Grand Trunk Railway from New Hampshire and Vermont,and were being distributed and sold among the farmers along the line, many of whom had sold off from their herds much more desirable animals, such as our drovers are selecting every week for the Brighton market, and many of which command a fancy price in Boston, owing to the now undisputed fact, that Maine cows are practically free from tuberculosis, and that we have the minimum amount of any New England state. This being conceded, our drovers are seeking out and purchasing a class of cows, of which the supply will soon be unequal to the demand, as they select only the best, and while discarding cows that are too old or too young, or farrow, they are able to offer the farmer a few dollars extra price for his best milch cows, often leaving behind two that cannot supply the amount of milk or butter of the one sold, leaving them two *to care for* and two *to feed*, to obtain the equal product of the one let go. If the cows that were being brought into Maine at a lower price compared favorably with those being sold out of our State, there would not have been so much objection to them, if *tested before admitted*, but they were as a rule old cows that were being discarded from farms in other states and that would compare fairly with the cheap cows that were being brought into Maine by the car load previous to our first quarantine against Massachusetts. Coming down to the tuberculin test, which is now almost universally adopted by all veterinarians and state officials as the best and safest diagnostic agent yet discovered, we have had in this State, as in all others, plenty of skeptics and opponents who are always ready to condemn in advance any new departure from old customs, only to have the conviction forced upon them that it is an agent at once reliable and far more to be depended upon than any physical examination by our most experienced men. Of course, we have always had to depend upon physical examinations before tuberculin was discovered, and such an examination has not lost its usefulness now in many cases where the disease has reached a fair development, but as it has always proved that appearances in this disease are of the most unreliable nature, since tuberculin has supplied so well a long felt want, it only resolves that we can safely rely upon such tests, if the tuberculin can be depended upon and the tests are made by competent men. The veterinarians in this State who are making tests every week for drovers who buy for Brighton,who are largely members of the Maine State Veterinary Association, have recently adopted a resolution that they will for the future use a uniform brand of tuberculin in the making of such tests. The popularity of tuberculin tests had forced upon the market the product of rival chemists and importers, until many different kinds were being purchased and employed in this State, the inducement being furnished in many cases by the price at which it could be obtained, and without condemning any of the brands that have heretofore been used. The association have now agreed upon Koch's, as this has so far furnished uniform reliable results, almost equally with that furnished by the "Bureau of Animal Industry" at Washington. The Government tuberculin is never sold to veterinarians and is only furnished to boards of cattle commissioners of the several states free, upon conditions binding them not to allow it to be used in private practice, and only for official work.

Early last spring our Board had several consultations with the Board of Health of the City of Portland in regard to the inspection of all herds that supplied Portland with milk; not that tuberculosis was known to exist in any such herd, but the Board of Health were apprehensive that such might be the case. As early as last May our Board entered upon the work of officially inspecting all the herds that were fairly accessible and within a reasonable distance of Portland, using tuberculin tests wherever there were any cases that seemed to require it, or where the normal temperature of the animals was above the usual elevation, and after a careful inspection of many hundreds of cows that supply the city of Portland with milk, we have failed to discover a single case of tuberculosis in any one of them, although we have found several herds kept in such unclean tie-ups and under such unsanitary conditions, as clearly call for prompt action upon the Boards of Health of several towns in Cumberland and other counties, that should compel the owners and attendants to see that the animals under their charge should be provided with better ventilation and more sunshine, and not be allowed to wallow in their own excrement throughout the long confinement of the winter months.

As a rule, however, we have found the dairy herds inspected by us to be well nourished and provided with comfortable quarters, and it is a most remarkable fact that among the large number we have examined, not a single case of tuberculosis or other contagious disease should have been found among all the animals that furnish the most important food product that enters into the daily rations of every man, woman and child in the community.

The cases of typhoid fever that were reported to our Board by the health officers of Biddeford last October, and that were at first supposed to be due to the use of diseased milk, led to the inspection and *testing* of every herd that had supplied the patients affected, with their milk supply, which proved that the animals in such herds were entirely free from all suspicion; while the examination developed the fact that the whole trouble resulted from washing the milk cans with impure water drawn from wells that were clearly contaminated with the surface drainage, coming from barn yards and sink spouts in close proximity to the water supply.

A case in point that has been attended with much more serious results, has occurred in Connecticut, and which has been reported by the Secretary of the Board of Health of that State. Dr. Lindsey reports:

"The most severe epidemic of typhoid fever of which there is any record in Connecticut, is now in progress in Stamford. Thus far more than 200 cases have occurred in a town of about 18,000 inhabitants. Careful investigation of its origin is being made and in due time will be published. The evidence at present seems conclusive that the disease was spread from infected milk, and that the milk became infected by washing the milk cans with water from a highly polluted well. How the special infection got into the well has not been definitely determined, but the close proximity of two privy vaults is very suggestive.

There could not be a more convincing illustration of the importance of some authoritive supervision of the ways and methods of milk production for public use. So long ago as 1881, fifty typhoid epidemics from infected milk had been traced in England, and now all English dairies are subject to the supervision and control, in a sanitary sense, of health officials."

TRACED TO A MILKMAN.

USED WATER THAT CAUSED A TYPHOID FEVER EPIDEMIC.

STAMFORD, CONN., June 4.—The typhoid fever scare of a month or more since has taken on a sensational phase in the arrest this evening of Henry J. Blackham, a milkman. A great deal of feeling is expressed against Blackham since the local and state board of health announced they traced the origin of the epidemic to his dairy, where his milk cans were washed in water drawn from an infected well. A minister suggested that Blackham should be tarred and feathered and ridden out of town on a rail.

The warrant served on Blackham charges manslaughter in causing the death of John F. King, a victim of the fever epidemic. The complaint is that Blackham recklessly used the water from a well containing germs of typhoid fever to wash cans and that he sold milk in which poisonous substances were contained in solution.

Blackham is in jail and will doubtless remain there since it will be extremely difficult for him to secure a bondsman in or about Stamford. He takes his arrest coolly.

During the epidemic there were 400 cases of fever and 21 persons died.

The cases of anthrax already referred to among a herd of cattle at Canton, Maine, which destroyed seven head of young cattle, were the first to our knowledge to have occurred in Maine, and were supposed to have become effected through the purchase of grain fed the cattle that came to Canton in a Western Wabash car, in which the grain had come in contact with the litter and dropping of a previous load of cattle, which litter had not been removed from the car or otherwise disinfected. Anthrax among cattle has heretofore been prevalent in the West, and one of the most easily disseminated of all the contagious diseases among cattle. The recent outbreak in New Jersey, was supposed to have its origin from a load of imported hides from Russia into Delaware, the refuse from the tanneries being used as a fertilizer. Cattle were thrown into the Delaware bay and carried by the tides to the New Jersey shores, where the disease first made its appearance, near the marshes and low lands covered by tide water. Every precaution has been taken to prevent a recurrence of the disease, the premises thoroughly disinfected, and we do not anticipate any other cases in this State. Of the forty-three head of horses condemned for glanders and farcy the past year, but five of them were bred in Maine, the large majority coming from the West, while the Provinces contributed not a few of them. Western horses have been so cheap recently, that an usual number of them have been distributed throughout the State, although the number destroyed is twenty, one less than in 1894. In Massachusetts "during the year the Board has received notification of two hundred and fifty of such suspected cases; of these,two hundred and six have been condemned and killed and forty-four have been released. All cases of this nature that have been received have been attended to, and in every case that has been destroyed, post-mortem xamination has shown the disease."

"The commission has good reason for believing that much of the difficulty surrounding any attempt at the suppression of glanders and farcy is in the failure upon the part of some of these who make a business of treating sick horses, and who call themselves veterinarians, to report the cases that come to their knowledge. It is certainly true that practically no information of this kind is received from this source by the commission. Veterinary practitioners should be more anxious and more able than any other class of our community to be active in helping to suppress a disease which is so destructive to horses and so dangerous to mankind."

JOHN M. DEERING, Saco, President,

F. O. BEAL, Bangor, Secretary,

GEO. H. BAILEY, Deering, State Veterinary.

ANNUAL REPORT

OF THE

Maine State College Agricultural Experiment Station.

1895.

MAINE STATE COLLEGE.

AGRICULTURAL EXPERIMENT STATION.

THE STATION COUNCIL.

BENJAMIN FRANKLIN BRIGGS,............................Auburn.
ARTHUR LEE MOORE, B. S.,................................Limerick.
ELLIOTT WOOD,..Winthrop.
Committee of the Board of Trustees.
ABRAM WINEGARDNER HARRIS, Sc. D., President,........Orono.
President of the College.
WHITMAN HOWARD JORDAN, M. S., Secretary,............Orono.
Director of the Station.
BENJAMIN WALKER McKEEN,.........................Fryeburg.
Representative of the State Board of Agriculture.
ORA OTIS CROSBY,...Albion.
Representative of the Maine State Grange.
CHARLES S. POPE,
Representative of the State Pomological Society.
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LUCIUS HERBERT MERRILL, B. S.,.........................Orono.
FRANCIS LEROY HARVEY, Ph. D.,..........................Orono.
FREMONT LINCOLN RUSSELL, V. S.,......................Orono.
WELTON MARKS MUNSON, M. S.,...........................Orono.
Members of the Station Staff.

THE STATION STAFF.

THE PRESIDENT.
WHITMAN H. JORDAN, M. S..............................Director
JAMES M. BARTLETT, M. S................................Chemist
FRANCIS L. HARVEY, PH. D............Botanist and Entomologist
LUCIUS H. MERRILL, B. S................................Chemist
FREMONT L. RUSSELL, V. S.........................Veterinarian
WELTON M. MUNSON, M. S..........................Horticulturist
HARRIS P. GOULD, B. S...................Assistant in Horticulture
FRED C. MOULTON, M. S.......................Assistant Chemist
ANDREW M. SHAW...........Foreman in Experimental Agriculture
MRS. J. HAMLIN WAITT...................Clerk and Stenographer

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TREASURER'S REPORT.

Maine State College Agricultural Experiment Station in account with the United States appropriation, 1894-5:

Dr.

To receipts from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1895, as per act of Congress approved March 2, 1887		$15,000 00

Cr.

By salaries:		
(a) Director and administration officers	$1,705 84	
(b) Scientific staff	5,922 74	
(c) Assistant to scientific staff	1,708 35	
(d) Special and temporary services	221 00	
Total		$9,557 93
Labor:		
(a) Monthly employes	$164 62	
(c) Hourly	601 03	
Total		765 65
Publications:		
(a) For printing	$145 50	
(c) For envelopes for bulletins and reports	45 00	
(d) Other expenses	17 60	
Total		208 10
Postage and stationery		275 67
Freight and express		180 97
Heat, light and water:		
(a) Heat	$312 44	
(c) Water	100 00	
Total		412 44
Chemical supplies:		
(a) Chemicals	$106 56	
(b) Other supplies	179 55	
Total		286 11

Seeds, plants, and sundry supplies:		
(a) Agricultural	$ 44 85	
(b) Horticultural	451 78	
(c) Botanical	15 92	
(d) Entomological	19 25	
Total		$531 80
Fertilizers		167 65
Feeding stuffs		508 02
Library		111 12
Tools, implements, and machinery:		
(b) New purchases		135 31
Furniture and fixtures		118 35
Scientific apparatus		417 78
Live stock:		
(b) Cattle	$150 00	
Total		$150 00
Traveling expenses:		
(a) In supervision of Station work	$121 99	
(b) In attending various meetings	92 86	
Total		214 85
Contingent expenses		209 31
Building and repairs:		
(a) New buildings	$458 41	
(b) Improvements	96 92	
(c) Repairs	193 61	
Total		748 94
Totals		$15,000 00

REPORT OF DIRECTOR.

A. W. Harris, Ph. D., President Maine State College:

SIR:—I submit herewith a report of the work of the Maine Experiment Station for the year 1895.

It is gratifying to note that the scope and influence of the work of the station are increasing yearly. This is caused in part by new legislation affecting the station and in part by the fact that scientific appliances and information are becoming more and more a necessary factor of successful agriculture. Not only are the difficult questions of current agriclutural practice largely referred to science for an answer,rather than to popular beliefsas formerly was the case, but there is a pressing demand that the boundaries of knowledge be enlarged in matters pertaining to agriculture. Besides, the scientist, especially the chemist, is now being charged with the execution of laws affecting the farmer's interests. In all these directions the Maine Station has been more or less active.

FERTILIZER INSPECTION.

As has been stated in previous reports, it has been found that an analysis fee of $15 for each brand of fertilizer sold in the State to the extent of thirty tons or more is not sufficient to pay the expenses involved in an official inspection according to the terms of the law. Accordingly the legislature of 1895 was asked to so amend the law that the analysis fee should be $20 for each brand sold to the extent of ten tons or more.

The change in the analysis fee was secured, but through a clerical or other error, the thirty ton limit was retained. It now appears that the receipts from analysis fees will just about cover the proper expenses of a painstaking execution of the law. The indications are at this time that more brands of fertilizers will be sold in 1896 than ever before. Old companiesareincreasingthe number of brands they are offering and new companies are entering the State. Confusion is being added to confusion, and the day of a rational fertilizer trade appears to be as far away as ever. The number of brands paying a fee for 1896 probably will not be far from eighty, while the brands offered for sale in the State will undoubtedly considerably exceed one hundred. This means that perhaps thirty brands are 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 augment the work of inspection entirely out of proportion to the analyses fees paid. The text of the fertilizer may be found in this report.

The Inspection of Chemical Glass Ware in Creameries.

The bill introduced into the last legislature by Hon. Z. A. Gilbert, chairman of the committee on agriculture, requiring for one thing an inspection of the graduated glass ware used by creameries in determining the fat content of milk and cream, became a law. The director of this station is charged with the execution of this part of the law, either by himself or by some one he may designate.

Mr. J. M. Bartlett, one of the station chemists, was named to attend to this duty.

There has been very generally a disposition manifested on the part of creamery managers to comply with the terms of the law. The results so far reached justify the existence of the law, and testify to the wisdom of its promoters. The text of the law is printed herewith.

Investigations in Human Nutrition.

Acting upon recommendations made by Secretary Morton in 1893 Congress subsequently appropriated $10,000, to be used in making investigations in human nutrition. Professor W. O. Atwater of Wesleyan University, Middletown, Conn., was placed in the immediate charge of the expenditure of this fund and it may properly be considered a matter for congratulation that he regarded the Maine Experiment Station so favorably as to entrust to it a portion of this money to be used in conducting investigations.

Mr. F. C. Moulton, a graduate of the Maine State College, was engaged as an assistant to aid in this line of inquiry. Work was begun in February 1895 and has been industriously and faithfully prosecuted throughout the year, its object being to study the effect of the source of the food supply upon the amount and cost of the food consumed in the college boarding house, especial attention being given to the influence of an abundant supply of milk upon the amount and cost of the dietary.

The results reached indicate in general that the free use of milk does not increase food consumption and cheapens the cost of raw materials.

The Results for the Year.

The principal features of this report are the following: The result of an important study in plant nutrition, covering the work of two years, this being an attempt to learn something about the feeding capactiy of certain families and species of plants; an investigation into the influence of the ration upon the growth and composition of the animal body; experiments in feeding milch cows with a variety of foods, especially a silage corresponding to the Robertson Mixture; horticultural experiments; and a report concerning certain injurious insects and fungi, part of which consists of original observations on the life history of a Trypeta which is doing much damage to currants in the vicinity of Orono.

Owing to the absence of Professor Munson, the horticultural work has been less in 1895 than in previous years.

The activities of the station have been directed largely towards either the verification of existing beliefs or the discovery of new facts, and in so doing the station has certainly exercised its true function.

The director of the station feels that he should express his sincere appreciation of the faithful and loyal co-operation of his associates in prosecuting the work committed to their care.

W. H. JORDAN, Director.

Maine State College,
Orono, Me., December 31, 1895.

INVESTIGATION ON THE FORAGING POWERS OF SOME AGRICULTURAL PLANTS FOR PHOSPHORIC ACID.

L. H. MERRILL.

Several years ago Professor Balentine, then agriculturist of this station, began a series of experiments for the purpose of determining the "foraging power" of certain plants for phosphoric acid. The results then obtained were published in the annual report of this station for 1893.

These investigations were considered of such importance that after Professor Balentine's death the work was extended and continued. Eight species of plants were chosen, representing four orders: peas and clover (Leguminosae); turnips and ruta bagas (Cruciferae); barley and corn (Gramineae;) tomatoes and potatoes (Solanaceae). The plants were grown in the forcing house in wooden boxes, fourteen inches square and twelve inches deep, each containing 120 pounds of sand. This sand was obtained from a knoll near by, and having been taken from a depth of three or four feet was nearly free from organic matter. It was found to contain a very little phosphoric acid, but the total amount present was so far below what would be required by a vigorous plant that it is doubtful if its presence could be considered a disturbing factor. Owing to its almost complete inertness and its inability to puddle or pack, this soil has proved a very satisfactory medium, and was thought preferable to the mixture of sphagnum and coal ashes sometimes used in pot experiments.

Three forms of phosphates were used:

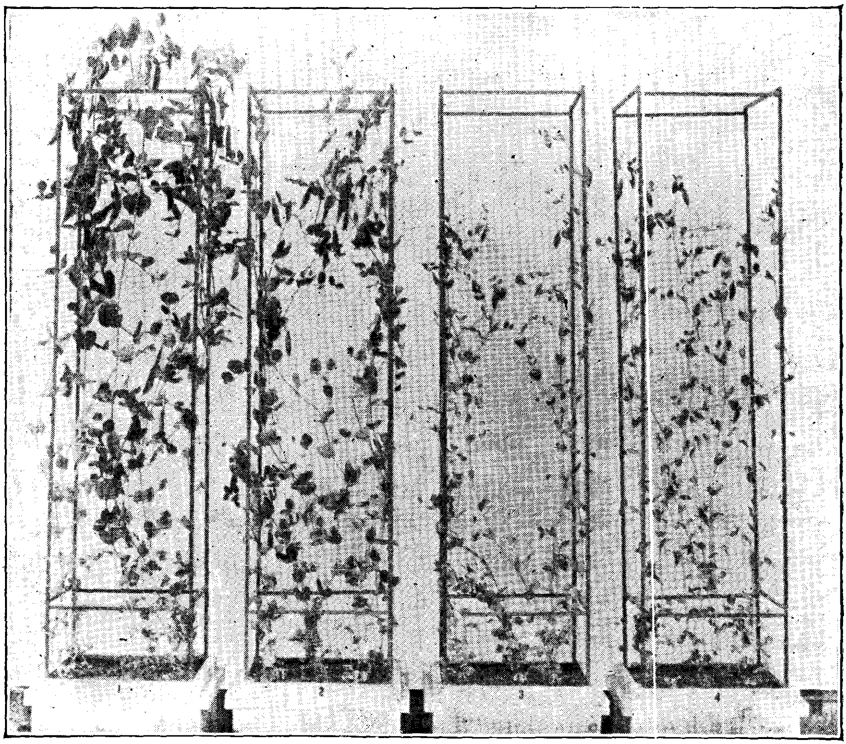
A. Acidulated Florida rock, containing 20.60 per cent. total phosphoric acid; 14.97 per cent. soluble; 3.70 per cent. insoluble; 16.90 per cent. "available."

B. Crude, finely ground Florida rock (Floats,) containing 32.88 per cent. phosphoric acid. This was obtained from the commercial ground rock by stirring it with water, allowing the coarser particles to subside and then pouring off the turbid water. The "Floats" are the sediments deposited from these washings.

C. A phosphate of iron and alumina, containing 49.58 per cent. phosphoric acid, a large part of which, 42.77 per cent., was soluble in ammonium citrate. This ready solubility in ammonium citrate is brought about by roasting the phosphate. It undergoes a

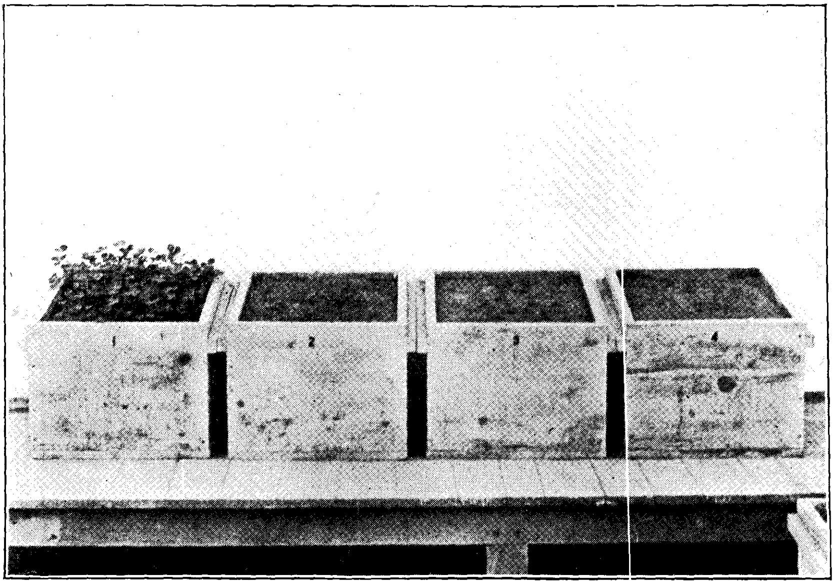
Maine State College Experiment Station Report, 1895. Plate I.

Peas.

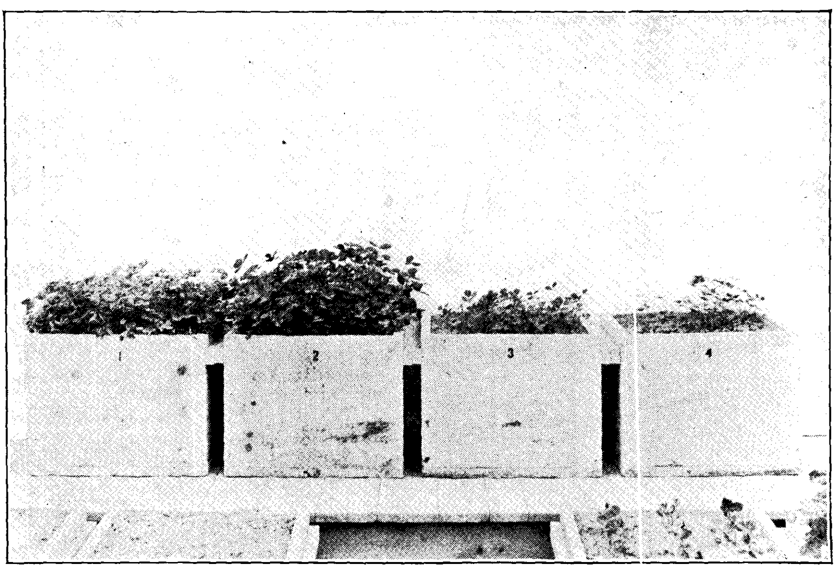


Box 1. Soluble Phosphoric Acid.
Box 2. Insoluble Phosphoric Acid—Florida Rock.
Box 3. Insoluble Phosphorate of Iron and Alumina.
Box 4. No Phosphate added.

Clover, immature.



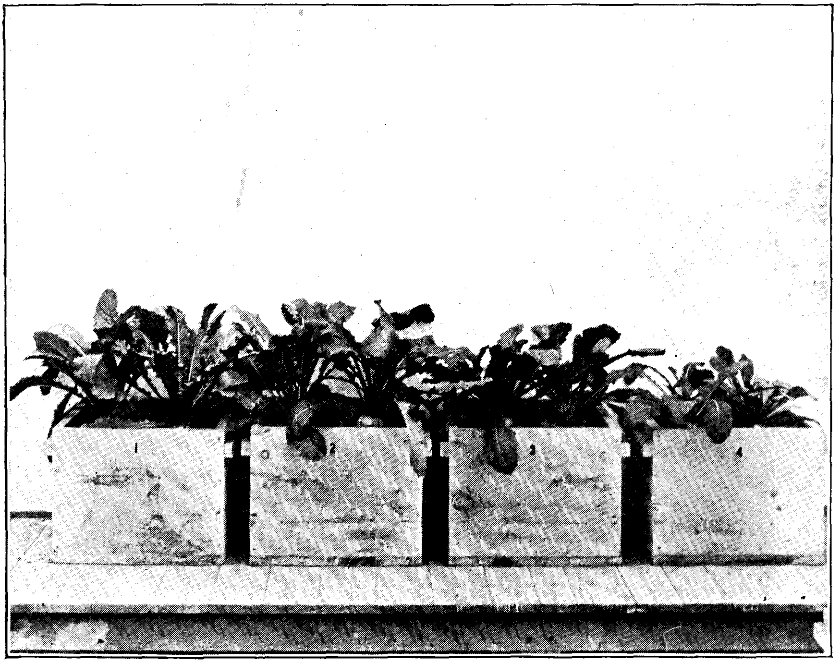
Clover, mature.



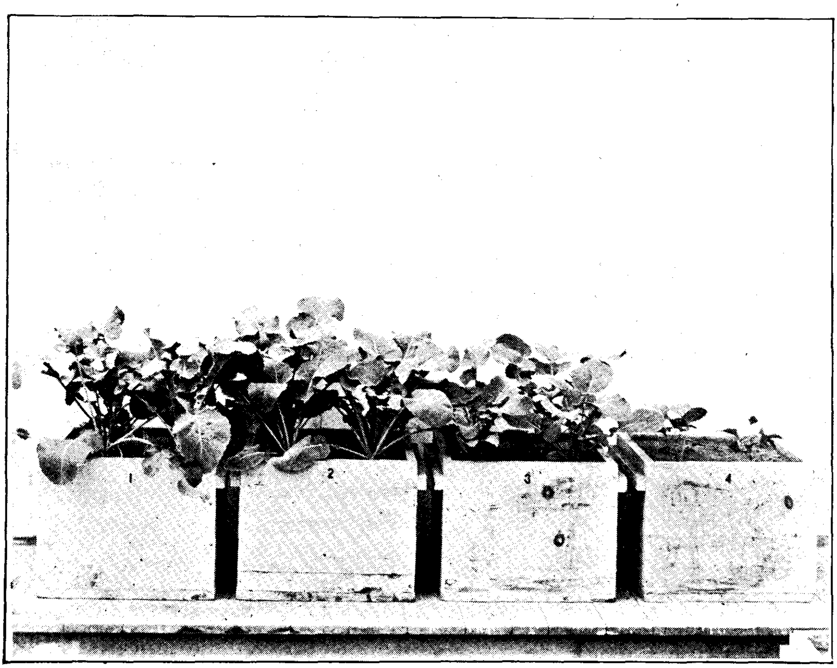
Box 1. **Soluble Phosphoric Acid.**
Box 2. **Insoluble Phosphoric Acid—Florida Rock.**
Box 3. **Insoluble Phosphorate of Iron and Alumina.**
Box 4. No Phosphate added.

Maine State College Experiment Station Report, 1895. Plate III.

Turnips.

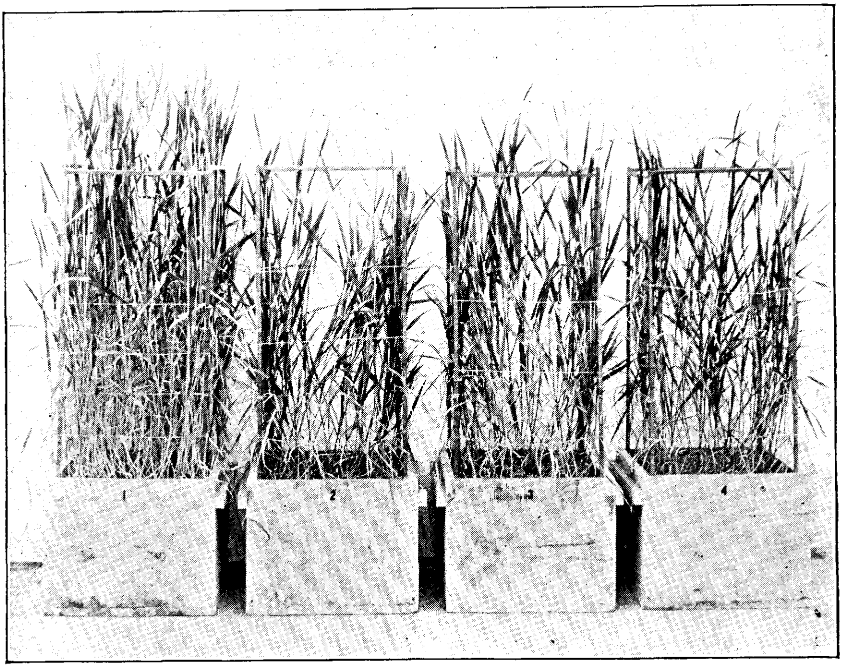


Ruta-bagas.

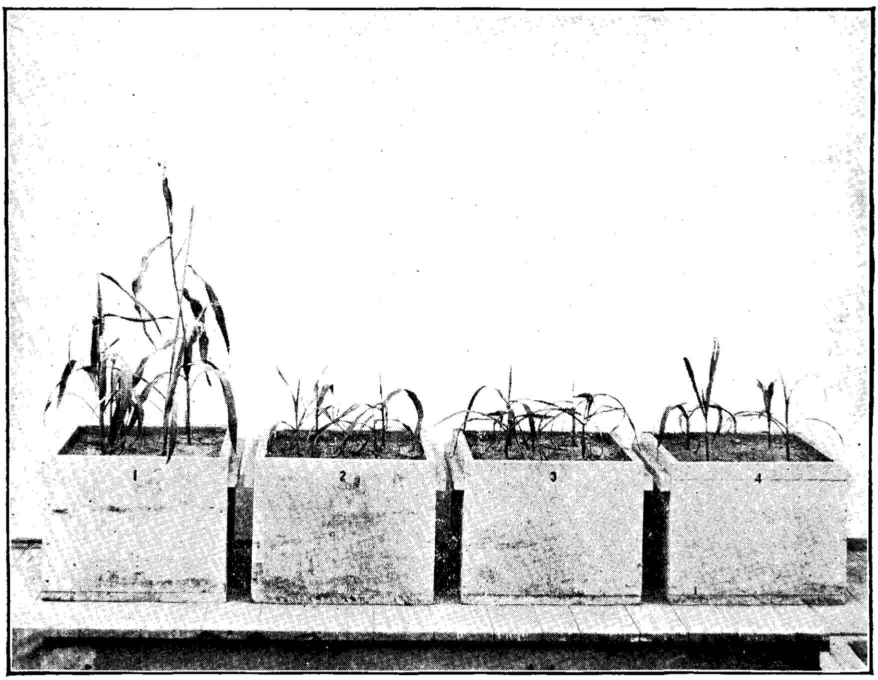


Box 1. Soluble Phosphoric Acid.
Box 2. Insoluble Phosphoric Acid—Florida Rock.
Box 3. Insoluble Phosphorate of Iron and Alumina.
Box 4. No Phosphate added.

Barley.

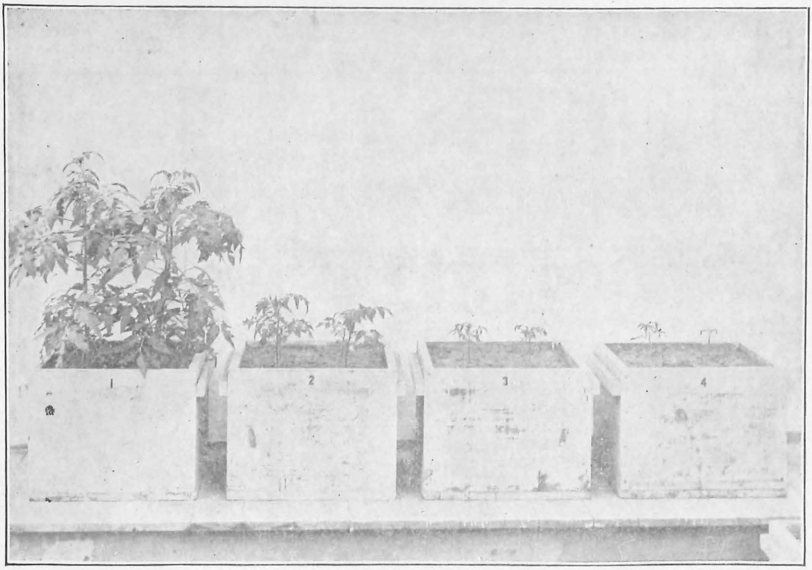


Corn.

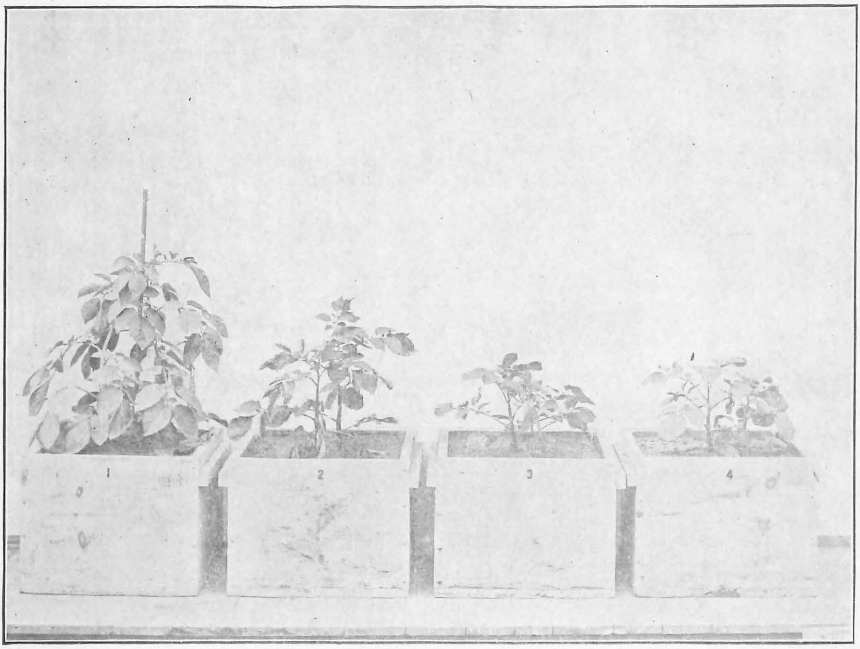


Box 1. Soluble Phosphoric Acid.
Box 2. Insoluble Phosphoric Acid—Florida Rock.
Box 3. Insoluble Phosphorate of Iron and Alumina.
Box 4. No Phosphate added.

Maine State College Experiment Station Report, 1895. Plate V.
Tomatoes.



Potatoes.



Box 1. Soluble Phosphoric Acid.
Box 2. Insoluble Phosphoric Acid—Florida Rock.
Box 3. Insoluble Phosphorate of Iron and Alumina.
Box 4. No Phosphate added.

change on standing whereby the phosphate gradually becomes less soluble in the citrate solution.

Ninety-six boxes were used, twelve for each kind of plant. In the first box the acid rock was used; in the second, the crude rock; in the third, the phosphate of iron and alumina; in the fourth, no phosphate. The next four boxes were treated in the same manner, and so on to the end. Thus it will be seen that for each kind of plant there were three boxes which received the same treatment.

Twenty grams of the crude Florida rock, containing 6.576 grams total phosphoric acid, were used for a single box. Of the other phosphates such quantities were used as contained the same total amount, 6.576 grams, of phosphoric acid.

To each box were also added: Ten grams sodium nitrate; five grams potassium chloride; five grams magnesium sulphate. To the boxes containing the phosphate of iron and alumina and to those containing no phosphate were also added ten grams calcium sulphate. All these materials were carefully mixed with the screened sand before it was placed in the boxes.

The clover and barley were planted in seven rows of seven plants each, or forty-nine plants to each box. The peas were thinned to nine plants. Of the other plants, four were grown in each box. All the conditions were made as uniform as possible in order that whatever differences were observable might fairly be attributed to the differences in the phosphates used. The seed was carefully selected, that only being used which was well formed and of uniform size. Such leaves as ripened before the plants matured were removed, dried and added to the plants when harvested. No attempt was made at pollination. As very few insects were present during the growth of the plants, the fruiting, as might have been expected, was very irregular.

When the most advanced plants of each species had reached their highest development, all the plants of that species were harvested. The plants were carefully dried, weighed and ground. The moisture was determined in each sample and the water free weights calculated.

The experiments were continued through three periods. In the first period the barley matured its heads, and many of the pea-pods were well filled. The second period extended through the shortest days of the winter, when the lack of sun and the lower temperature were unfavorable to the best development of the corn and tomatoes. The third period was made shorter than the others, and none of the plants reached their full development.

At the close of the second period the clover was not harvested, but was allowed to grow on through the third period.

All but one of the photographs from which the accompanying cuts were made were taken at the close of the second period. The second cut of the clover is from a photograph made at the end of the third period, and represents the same plants as those shown in the preceding illustration.

TABLE I.

YIELD OF DRY MATTER IN GRAMS FOR EACH OF THE THREE PERIODS.

A represents the acid rock, B the crude rock, C the phosphate of iron and alumina, D no phosphate.

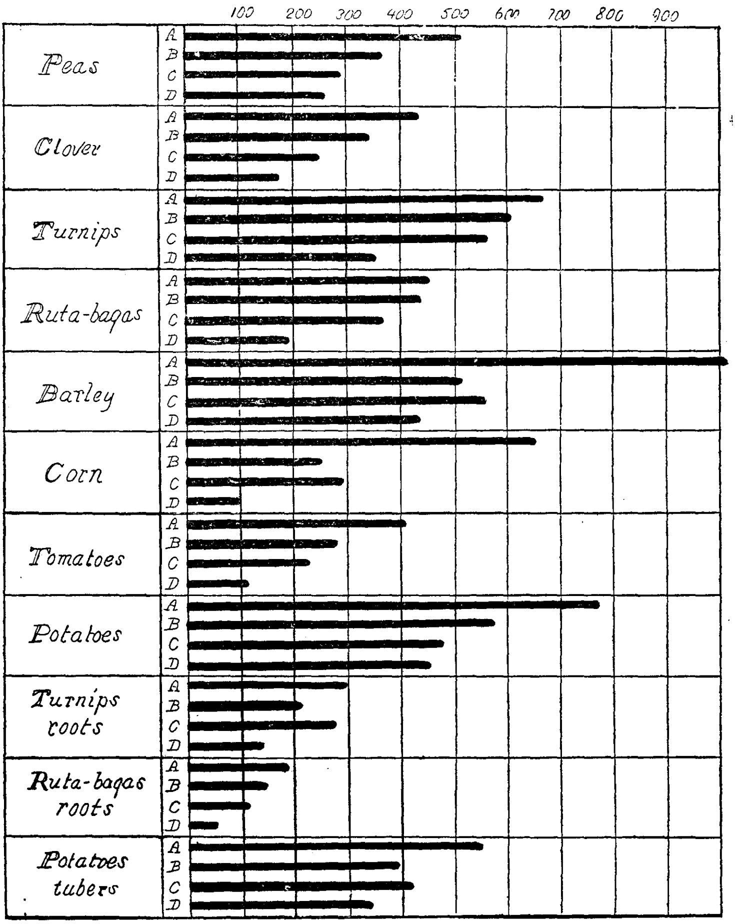
	First Period.				Second Period.				Third Period.			
	A	B	C	D	A	B	C	D	A	B	C	D
Peas	193.3	185.0	185.4	179.4	253.1	132.1	56.7	53.2	54.3	49.4	41.4	28.4
Clover	136.3	120.0	103.6	63.6	296.8	218.9	148.2	101.6				
Turnips	228.8	207.7	226.3	154.1	277.9	245.3	201.9	86.2	157.8	151.7	133.3	117.0
Rutabagas	154.9	167.6	176.8	132.0	240.0	215.6	132.5	31.0	61.0	52.5	55.8	30.1
Barley	335.8	269.5	259.1	197.0	500.0	131.5	164.2	127.2	179.6	113.1	136.1	112.6
Corn	491.1	228.9	261.7	61.6	55.5	7.4	6.3	6.3	106.9	17.6	25.8	24.9
Tomatoes	200.9	177.5	160.6	33.3	63.7	4.7	1.8	1.4	141.3	93.7	73.7	73.2
Potatoes	341.7	254.5	274.2	181.1	285.7	143.3	127.7	141.7	151.5	164.6	64.8	129.0
Turnips, roots	98.5	47.7	117.3	71.0	161.3	137.5	121.9	40.1	40.0	25.1	31.0	21.2
Rutabagas, roots	51.5	35.1	53.7	39.5	130.0	101.9	50.1	8.4	5.6	4.3	3.5	1.5
Potatoes, tubers	246.4	196.8	214.6	135.8	242.1	124.8	113.2	125.8	67.0	71.7	91.4	83.1

TABLE II.

TOTAL YIELD OF DRY MATTER FOR THE THREE PERIODS.

	A	B	C	D
Peas	500.7	366.5	283.5	261.0
Clover	433.1	338.9	251.8	165.2
Turnips, whole plant	664.5	604.7	561.5	357.3
Ruta bagas, whole plant	455.9	435.7	365.1	193.1
Barley	1015.4	514.1	559.4	436.8
Corn	653.5	253.9	293.8	92.8
Tomatoes	405.9	275.9	236.1	107.9
Potatoes, whole plant	778.9	562.4	466.7	451.8
Turnips, edible roots	299.8	210.3	270.2	132.3
Ruta bagas, edible roots	187.1	141.3	107.0	49.4
Potatoes, tubers	555.5	393.3	419.2	344.7

Table I shows the yield for each kind of plant grown, for each period. In Table II the weights for the three periods are condensed. The diagram which follows is designed to show graphically the same results as are given in Table II. Following the diagram may be seen the photographic illustrations showing the plants as they appeared at the time of harvesting.



A study of the tables and diagram shows:

1. All the plants receiving the phosphate of iron and alumina show a gain over those receiving no phosphate. This effect was most marked with the corn, the yield being three times as great as where no phosphate was used. The weight of the tomato plants was doubled. The turnips and ruta-bagas responded vigorously, the crop of roots being doubled. On the other hand, the peas and potatoes gained but little.

2. All the plants receiving the insoluble Florida rock show a gain over those to which no phosphate was given, the crops of clover ruta-bagas, corn, tomatoes and ruta-baga roots being more than doubled. The barley, potatoes and especially the potato tubers gained but little. All the plants showed a gain over those receiving the phosphate of iron and alumina except in the case of the barley, corn, turnip roots and potato tubers.

3. All the plants were benefited by the addition of the acid rock. The barley and corn show the most marked increase, the yield being double that from the crude rock. The ruta-bagas and the turnips derived nearly as much benefit from the crude rock as from the acid rock.

The effect of the acid rock was very marked, with all the plants grown, those receiving it, in nearly all cases, at once taking the lead and keeping it to the end. The plants were darker green in color, and the tubercules, which were developed on the roots of nearly all the leguminous plants, were larger and much more numerous. It was noticeable, however, that in some cases, especially with the clover, turnips and ruta-bagas, the good effects of the acid rock were more marked during the first few weeks of growth than at a later stage, when the roots had become more fully developed and had begun to forage for themselves. It would appear that the young plants feed but little upon the insoluble phosphates; but that the organic acids present in the sap of the roots exert a solvent action upon the insoluble phosphates in the soil, gradually converting them into available forms.

COMMENTS.

W. H. Jordan.

It is often difficult, perhaps impossible in some instances, to so display experimental data that they shall convey to the reader the full significance of the results reached. This appears to be peculiarly the case with the forcing house experiments discussed on preceding pages by Mr. Merrill. The object of the investigation under discussion is a study of the ability, relatively and absolutely of certain plants to appropriate phosphoric acid to their uses when presented to them in various forms, or at least when applied to the soil in various forms.

These plants have been grown in a forcing house in a manner which has been described, where it has been possible to observe them through the various stages of development, and the writer by his observations is convinced of certain facts which are not easily made clear by a display of numerical data, either in a tabular or graphic form. Even the photographic illustrations fail to show more than one or two periods of growth.

The purpose, therefore, of supplementing Mr. Merrill's clear presentation of the facts reached is to emphasize his statements by a discussion based partly on numerical data and partly upon data which may not be expressed in numbers.

It is well to remark first of all, that this investigation may be regarded from two standpoints; (1) From the plant food side, when the prominent consideration is the availability of certain materials as plant food, or (2) from the plant side, when the prominent consideration is the absolute or relative ability of different species of plants to obtain food from certain sources. We will discuss our experimental data from both points of view.

(1) The acid-rock or soluble phosphoric acid proved to be the most available.

This is true whether we base our judgment upon the early growth of the young plants or upon the total growth made. There was no instance in which the young plants fed by the soluble phosphoric acid did not show a more immediate and generous growth than when fed by the water-insoluble, and if we consider only average results, the total growth was in all cases largest from the soluble phosphoric acid though not greatly larger with certain plants. If we consider the readiness with which any material is appropriated by the very young plant as the crucial test of its availability, then the phosphoric acid used in a soluble form has a relative value greater than is indicated by the growth of the plants during a somewhat extended period of time.

The influence of the soluble phosphoric acid was in the direction of early maturity because it induced prompt early growth, but it was not true in all instances that the final growth from this form of acid was very much or even any greater than from the water-insoluble forms. The plants grown on the soluble acid certainly were the earliest plants to mature, even though they finally grew no larger than some others. This fact is one of greater importance in the production of crops out of doors during a short season, than in the forcing house where the season may be indefinitely lengthened.

(2) The water-insoluble forms of phosphoric acid were used more or less freely by all of the eight species of plants grown. This was true both with the crude Florida rock and with the phosphates of iron and alumina, although the phosphoric acid from the ground Florida rock appeared to be the more freely used in a majority of cases. While as we shall see later, this availability of the water-insoluble phosphates varied greatly with different species of plants, it was sufficient in most instances to induce a material increase of growth. It is clear, however, when we consider that nearly all of the phosphoric acid of the phosphates of iron and alumina was soluble in ammonium citrate, that in these experiments, at least, the availability of the water-soluble phosphoric acid differed greatly in degree from the citrate-soluble. The present custom of classifying the water-soluble and citrate-soluble phosphoric acid of our fertilizers together as available does not appear to be rational in the light of these experiments.

(3) The solubility of a phosphate in an ammonium citrate solution at sixty-five degrees C did not in these experiments give a correct measure of the relative availability of the phosphoric acid after application to the soil.

Two mineral phosphates were used in these experiments, one being Florida rock, containing 2.46 per cent. of phosphoric acid soluble in an ammonium citrate solution at sixty-five degrees C, the other being the so-called Redonda phosphate, consisting chiefly of hydrated phosphates of iron and alumina, which, after dehydration, contained 42.77 per cent. of phosphoric acid soluble in ammonium citrate. In the one case only seven per cent. of the phosphoric acid was soluble in the citrate solution, while in the other case eighty-six per cent. of the phosphoric acid was soluble in that liquid. If the citrate soluble phosphates are actually readily available to plants both before and after entering the soil, then the dehydrated Redonda rock should have been greatly superior to the Florida rock as a source of plant food. This did not prove to be the case, the fact being that the Florida rock proved to be the more useful. Any impartial observer who watched these experiments must have been convinced that in a majority of cases the plants were feeding more readily upon the Florida rock than upon the other material and the figures reached substantiate this conclusion. Only with the barley and corn did the

Redonda phosphate show a superior value, which, though evident, was not marked.

There are two explanations which may be suggested for this fact: (a) The action of the citrate solution is not even an approximate measure of the root action of plants, or (b) the dehydrated phosphates of iron and alumina revert to a hydrated and less available condition after entering the soil.

(4) The eight species of plants employed in these experiments showed greatly unlike ability to appropriate phosphoric acid from the water-insoluble phosphates. The differences in this respect were striking. From almost the very earliest period of growth, the two varieties of turnips appeared to feed nearly as freely upon the Florida rock as upon the dissolved Florida rock, whereas the barley, corn, potatoes and tomatoes derived but little if any benefit from the water-insoluble phosphates until during the more advanced stages of growth, and even then the benefit was not nearly so marked as with the cruciferous plants.

The leguminous plants, viz. peas and clover, appeared to occupy a position between the cruciferous and graminaceous plants, showing a very material increase of early development due to the water-insoluble phosphates.

The facts so far observed suggest that this difference in feeding power which these plants exhibited is more than a difference between single species and relates to groups of species.

(5) The ability to appropriate water-insoluble phosphoric acid appeared with some species of plants to greatly increase as the plants developed.

While the turnips and ruta-bagas fed freely upon the crude Florida rock even in the earlier stages of growth, it was observed that not until after some weeks did the clover, tomatoes and in one case the corn, begin to make any perceptible use of the water-nsoluble phosphates.

The photographs showing the clover in two stages of growth illustrate the above statement very clearly. This observed increase of feeding power as the plants matured, so that they fed upon the crude ground rock, especially the clover, suggests that the crude ground phosphates may be made a cheap and useful source of phosphoric acid in grass fields, and on the other hand the inability of several species, notably certain of the gramineae and solanaceae, to use the water-insoluble phosphates freely in the earlier periods of growth, emphasizes the wisdom of using chiefly water-soluble phosphoric acid upon hoed crops, especially where early maturty is essential.

The following table shows very clearly the relation of growth of the several species when fed with the different forms of phosphoric acid.

TABLE III.

RELATIVE PERCENTAGE YIELD WITH THE SEVERAL FORMS OF PHOSPHORIC ACID, THE YIELD WITH NO PHOSPHORIC ACID BEING TAKEN AS 100.

		Phosphoric acid soluble in water.	Phosphoric acid in ground Florida rock.	Phosphate of iron and alumina.	No phosphoric acid.
Peas	First period	108	103	103	100
	Second period	478	248	107	100
	Third period	191	174	146	100
Turnips	First period	148	135	147	100
	Second period	325	285	234	100
	Third period	135	130	114	100
Ruta bagas	First period	117	124	134	100
	Second period	774	695	427	100
	Third period	203	174	185	100
Barley	First period	170	137	131	100
	Second period	393	102	129	100
	Third period	159	100	121	100
Corn	First period	797	372	425	100
	Second period	881	117	100	100
	Third period	429	71	104	100
Tomatoes	First period	603	533	482	100
	Second period	4549	336	128	100
	Third period	193	128	101	100

THE PROFITABLE AMOUNT OF SEED PER ACRE FOR CORN.

W. H. JORDAN.

In 1894 an experiment was conducted for the purpose of testing the influence of the rate of seeding upon the growth of corn, the results being given in the Station Report for 1893, pp. 33-34. This experiment has been repeated in 1895 and the results are given below.

As in 1894 one acre of land was used. This area received a dressing of ten two-horse loads of stable manure and 750 pounds of commercial fertilizer, the latter being made up of 500 pounds acid phosphate, 100 pounds muriate of potash and 150 pounds nitrate of soda.The acre was divided into twelve plots, or four sets of plots with three plots in a set.

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 intention was to allow the corn to stand only until it began to glaze and then cut it and store it in the silo. Owing to a necessary delay, the corn stood until it was too ripe for the best results as a silage crop, and while this fact does not affect the actual or comparative yield of dry matter, it accounts for the loss per cent of water in the crop as harvested. Below may be seen the composition of the corn for 1895 and the rates of yield for both years.

COMPOSITION OF CORN FROM VARYING QUANTITIES OF SEED.

	Composition of the Corn as Harvested in 1895.					
	Water—per cent.	Ash—per cent.	Protein—per cent.	Fiber—per cent.	Nitrogen free-extract—per cent.	Fats—per cent.
Kernels 6 inches apart or 6 in 3 feet ..	62.58	1.88	2.77	7.60	23.73	1.44
Kernels 9 inches apart or 4 in 3 feet ..	61.53	1.40	3.37	6.25	25.79	1.66
Kernels 12 inches apart or 3 in 3 feet ..	64.55	1.68	3.10	6.67	22.57	1.43

YIELD PER ACRE OF CORN FROM VARYING QUANTITIES OF SEED.

Crop of 1894.			Crop of 1895.		
Total yield—pounds.	Per cent dry matter.	Yield dry matter—pounds.	Total yield—pounds.	Per cent dry matter.	Yield dry matter—pounds.
21,315	21.1	4,497	16,020	37.42	5,995
22,530	20.9	4,709	15,780	38.47	6,071
20,190	20.5	4,139	15,675	35.45	5,558

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 two seasons with the several rates of seeding are as follows: Kernels six inches apart 5.246 pounds; at nine inches 5.390 pounds; at twelve inches 4.848 pounds.

There appears so far to be only a small difference between six inches and nine inches seeding, whereas the yield from the twelve inches was materially smaller both years.

It should be noted, that the corn from the nine inch and twelve inch seeding was eared more satisfactorily than that from the six inch.

SUNFLOWER HEADS AND BLACKEYE PEAS AS SILAGE CROPS.

J. M. Bartlett.

In growing crops economically for this purpose two very important points must be considered.

1st. The adaptability of the crop to the process, its keeping qualities &c.

2nd. Its productiveness.

Corn is acknowledged by every one who has had much experience in the matter to be the great silage crop of this country. It is true that many other crops have been successfully kept in the silo but there is no other fodder which so uniformly produces good silage as corn.

If allowed to mature until the kernels become glazed it furnishes a valuable, succulent food for winter use, much relished by stock. It does not make, however, when fed with hay alone a properly balanced ration for milch cows. Both the grain and stalks are deficient in protein therefore it is necessary to feed with it some foods like cotton seed or linseed meal rich in protein to secure the best results.

Professor Robertson of Toronto, has suggested putting other fodders quite rich in protein with corn in the silo to make a more nearly balanced food. Horse beans and sunflower heads are the materials he uses and silage thus made has come to be called the Robertson Mixture. As a rule fodders rich in protein, like the legumes, do not keep well when put in the silo alone, but mixed with corn they are usually quite well preserved.

At the time this experiment was made, horse beans could not be obtained, consequently peas, which have about the same composition, were substituted.

It was necessary to plant them late in the season that they might not mature too early for the corn and sunflowers. The latter part of the season was unfavorable to their growth, mildew affecting them badly and consequently the yield was rather light. The sunflowers were grown on land put in the same condition as for corn, and the seed was planted one foot apart in drills three and one-half feet apart. The plants grew well and a good average yield was secured. The expense of raising the crop may be estimated to be the same as for corn.

The proportions of the different materials used for the silage was the same as for the Robertson Mixture namely: one-fourth acre sunflowers, and one-half acre of peas to one acre of corn. All were run through the cutter, packed in the silo by the ordinary method, and as is elsewhere noted, the silage kept perfectly and when opened in February was found to be in first class condition.

In the following tables will be found data giving information as to yield and composition of the crops.

TABLE IV.

YIELD PER ACRE.

	Fresh—pounds.	Air-dry—lbs.	Water-free—pounds.
Sunflower heads	12,720	2,200	2,040
Peas, whole plant	13,380	2,013	1,861

TABLE V.

COMPOSITION OF SUNFLOWER HEADS AND PEAS.

	Air Dry.						Water Free.				
	Water.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Ether extract.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Ether extract.
	%	%	%	%	%	%	%	%	%	%	%
Sunflower heads	7.27	6.73	12.63	24.4	34.56	14.41	7.26	13.62	26.30	37.27	15.55
Blackeye peas	7.57	7.45	17.19	30.00	35.18	2.61	8.06	18.60	32.47	38.04	2.83
	Fresh Plant.										
Sunflower heads	84	1.16	2.18	4.21	5.96	2.49					
Peas, whole plant	86.1	1.12	2.59	4.51	5.29	.39					

TABLE VI.

YIELD PER ACRE OF NUTRIENTS COMPARED WITH MAINE FIELD CORN AND RED CLOVER.

	Dry substance—pounds.	Protein—pounds.	Carbohydrates—pounds.	Fat—pounds.
Maine field corn	4,224	385	3,469	156
Red clover	3,400	520	3,150	133
Sunflower heads	2,040	278	1,296	317
Peas, whole plant	1,861	249	1,312	53

TABLE VII.

NUTRIENTS PER TON OF TWO THOUSAND POUNDS WATER FREE SUBSTANCE COMPARED WITH OTHER FODDERS.

	Peas—pounds.	Sunflower heads—pounds.	Red clover—pounds.	Timothy—pounds.	Mature Flint corn—pounds.	Immature Southern corn—lbs.
Protein	372.0	272.4	306	160	184	166
Carbohydrates	1,410.2	1,271.4	1,472	1,670	1,622	1,668
Fat	58.6	311.0	78	62	74	52
	1,838.8	1,854.8	1,856	1,892	1,880	1,886

SUMMARY.

So far as is indicated by this experiment it would seem that sunflowers are not nearly as profitable a crop to raise as corn. With the same cultivation corn produces a third more protein and nearly twice as much carbohydrate material as sunflower heads.

When compared with our common red clover it will be seen that an average crop of the latter plant produces nearly twice as much protein and more carboyhydrate matter per acre. From this very limited experience we are not favorably impressed with the sunflower as a profitable silage crop. The peas are not considered, as a fair average crop was not secured.

FEEDING EXPERIMENTS WITH MILCH COWS.

J. M. Bartlett.

For the following experiments six cows known by the numbers 1, 2, 3, 4, 5 and 6 were used. All were grade Jerseys except number 4 which was a thoroughbred.

Nos. 4, 5, 6, were owned by the station and used for experimental work the previous year. Nos. 1, 2, 3, were purchased a short time before beginning the experiments. Although they were all fairly good cows their condition was not such as to make them most desirable for experimental purposes. In comparing one ration with another it is necessary to avoid heavy feeding else the differences that one kind of food might show in comparison with another might be obliterated by the excess of nutrients fed in a large ration. It is therefore essential that a grain ration near the minimum rather than the maximum limit should be employed to secure results of any value.

Cow No. 4 was rather old and had also been receiving more grain than could be used in experimental feeding, consequently she shrank rapidly in flesh and milk yield when put on the smaller ration.

Nos. 1, 2, 3, had been fed quite liberally on cotton seed meal by their previous owner and a reduction in their grain, together with the effect of transporting them 100 miles in very cold weather,caused a very material shrinkage in the milk flow. No. 1 proved to be worthless for our work as she leaked her milk quite badly, and was changed for another animal during the latter part of the first experiment.

The cows were so nearly of a size that they were all fed alike. They were weighed at the beginning and end of each period. The milk of each cow was carefully weighed at each milking and samples taken during the last five days of the periods were analyzed and the results taken as an average for the period in which they were obtained. All food given the cows was weighed as was also the water they drank.

The temperature of the stable was taken morning, noon and night.

EXPERIMENT I.

Wheat Meal Compared with Corn Meal.

It occasionally happens as was the case in the fall of 1894 that the crops in the corn raising belt are cut off through drought or other causes while those in the wheat belt are bountiful. At such times the country is therefore deficient in its corn supply and the price of that grain advances. On the other hand wheat is plentiful and sells at a low figure. At the time this experiment was made corn was selling at ten cents more per hundred pounds than wheat meal and dealers in this section said they were selling more wheat for feed than corn, and farmers naturally were asking which was the more economical grain to feed at those prices. Chemical analysis shows wheat to be slightly richer in protein and to contain on the average less moisture than corn meal. We should therefore consider it worth more pound for pound to feed and the following data would seem to sustain that position:

THE TWO RATIONS FED DAILY.

RATION I.	RATION II.
Timothy hay, 18 pounds.	Timothy hay, 18 pounds.
Wheat meal, 5 pounds.	Corn meal, 5 pounds.
Cotton seed meal, 2 pounds.	Cotton seed meal, 2 pounds.

TABLE VIII.

COMPOSITION OF FOODS USED.

	Water—%.	Ash—%.	Protein.—%.	Fiber—%.	Nitrogen free-extract—%.	Fat—%.
Timothy hay	13.18	4.37	5.87	29.03	45.08	2.47
Wheat meal	9.29	2.10	12.81	2.62	71.06	2.12
Corn meal	14.98	1.42	9.17	1.90	68.76	3.77
Cotton seed meal	8.17	7.17	42.31	5.62	23.65	13.08

TABLE IX.

FOOD CONSUMED BY EACH COW FOR EACH PERIOD OF TWENTY-ONE DAYS.

PERIOD I.	PERIOD II.	PERIOD III.
Timothy hay 348 lbs.	Timothy hay 348 lbs.	Timothy hay 348 lbs.
Wheat meal 105 lbs.	Corn meal 105 lbs.	Wheat meal 105 lbs.
Cotton seed meal 42 lbs.	Cotton seed meal 42 lbs.	Cotton seed meal 42 lbs.

TABLE X.

*DIGESTIBLE NUTRIENTS CONSUMED BY EACH COW.

PERIOD I.		PERIOD II.		PERIOD III.	
	Pounds.		Pounds.		Pounds.
Protein	37.51	Protein	32.29	Protein	37.51
Carbohydrates	237.57	Carbohydrates	237.35	Carbohydrates	237.57
Fat	12.55	Fat	14.19	Fats	12.55
Total	287.63	Total	283.83	Total	287.63
Nutritive ratio 1 to 7.09.		Nutritive ratio 1 to 8.7.		Nutritive ratio 1 to 7.09.	

* American coefficients were used—those given for wheat middlings were used for the wheat meal.

TABLE XI.

WATER DRANK DAILY (POUNDS).

NUMBER OF COW.	1	2	3	4	6
First period	57	60	68	58	57
Second period	64	65	77	59	57
Third period	-	70	81	60	60

TABLE XII.

COMPOSITION OF MILK FOR LAST FIVE DAYS OF EACH PERIOD.

	Cow 1.		Cow 2.		Cow 3.		Cow 4.		Cow 6.	
	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.
	%	%	%	%	%	%	%	%	%	%
January 11	13.39	4.35	13.82	4.60	12.26	3.60	12.90	4.60	14.98	5.20
January 12	13.48	4.45	13.84	4.55	12.42	3.75	12.63	3.95	14.55	4.75
January 13	13.34	4.30	13.69	4.40	12.20	3.45	12.62	4.05	14.48	5.00
January 14	13.42	4.20	13.80	4.60	12.88	4.10	13.04	4.70	15.09	5.10
January 15	13.73	4.40	13.81	4.40	12.87	3.90	13.05	4.60	15.18	5.35
Average	13.47	4.34	13.79	4.51	12.52	3.76	12.85	4.38	14.85	5.08
February 1	13.52	4.15	14.33	4.75	12.88	3.80	13.78	4.85	15.19	5.15
February 2	13.36	4.30	13.94	4.65	12.74	4.10	13.28	4.40	14.95	5.30
February 3	13.71	4.70	14.02	4.80	12.75	3.07	13.09	4.40	15.25	5.45
February 4	13.62	4.60	14.39	4.95	12.71	3.80	13.32	4.30	15.40	5.40
February 5	13.23	4.20	13.89	4.15	13.01	4.10	13.86	4.90	15.10	5.15
Average	13.49	4.39	14.11	4.66	12.82	3.77	13.47	4.57	15.18	4.29
February 22	......	......	14.36	4.85	13.35	4.10	13.94	5.00	15.21	5.30
February 23	......	......	14.63	4.20	13.32	4.40	14.34	5.15	15.81	5.55
February 24	......	.....	14.32	5.00	13.46	4.35	14.50	5.45	15.68	5.55
February 25	.....	......	14.65	5.20	13.61	4.50	14.48	5.65	16.05	5.75
February 26	.....	......	14.54	5.20	12.77	4.00	14.36	5.40	15.02	5.30
Average	.....	......	14.50	4.89	13.30	4.27	14.32	5.33	15.55	5.49

TABLE XIII.

MILK YIELD PER WEEK IN POUNDS, AND AVERAGE TEMPERATURE OF STABLE.

DECEMBER 26 TO JANUARY 15.	Temperature—Fahrenheit.	Number of Cows.				
		1.	2.	3.	4.	6.
First week	....	114	147.8	156.5	143.6	125.6
Second week	41	104.3	147	155	126.6	115.1
Third week	47	112.8	142.5	159	119.3	119.9
JANUARY 16 TO FEBRUARY 5.						
First week	45	105.3	141.3	153.9	114.8	121.1
Second week	44	106.1	139.1	152.7	114.3	120
Third week	41	100.8	140.6	148.9	111.7	118.5
FEBRUARY 6 TO FEBRUARY 26.						
First week	38	....	132.7	140.6	101.5	113.9
Second week	49	....	127.5	141.3	98.7	114.6
Third week	44	....	126.0	134.6	87.3	111.4

TABLE XIV.

WEIGHT OF COWS. WEIGHT GAINED. WEIGHT LOST. MILK, SOLIDS AND FAT PRODUCED BY EACH COW (POUNDS.)

	Cow.	Weight.	Weight gained.	Weight lost.	Milk.	Solids.	Fat.
	1	830	5	......	336	45.26	14.58
PERIOD I.	2	930	15	......	437.37	60.32	19.73
(Wheat meal.)	3	880	......	5	469.37	58.77	17.65
21 days.	4	830	....	15	389.50	50.17	17.05
	6	859	8	.. .	360.75	53.58	18.32
Total	......	......	28	20	1,992.99	268.10	87.33
Total omitting I	.....	.. . .	......	......	1,656.99	222.84	72.75
Daily yield	......	......	......	......	19.73	2.65	.87
	1	835	.....	18	322.25	43.54	14.15
PERIOD II.	2	945	......	30	421.00	59.40	19.62
(Corn meal.)	3	875	... .	20	455.37	58.11	17.09
21 days.	4	815	......	6	340.87	45.88	15.58
	6	867	......	2	359.62	54.57	19.02
Total	......	......	......	76	1,899.11	261.50	85.46
Total omitting I	.....	......	......	......	1,576.86	217.96	71.31
Daily yield	.....	.....	.....	....	18.78	2.60	.85
PERIOD III.	2	915	10	......	386.25	55.99	18.88
(Wheat meal.)	3	855	5	.....	416.50	55.39	17.78
21 days.	4	804	......	19	287.50	41.17	15.32
	6	865	10	......	339.75	52.84	18.66
Total	......	......	25	19	1,430.00	205.39	70.44
Daily	......	......	......	......	17.03	2.45	.84

Conclusions drawn from the foregoing data.

1st. Wheat meal pound for pound furnishes more food than corn meal, noticeably more digestible protein. Table X.

2nd. When wheat can be bought at about the same price as corn it is a more economical grain to buy.

3rd. It is more valuable than corn to feed with hay or such grains as barley and oats because richer in protein.

4th. When fed to milch cows in the proportions given in this experiment it produced as much milk and greater gain in flesh, as shown in Table XIV. It is very noticeable that the rations fed in Period I and III were more efficient than that fed in Period II. While there was a very gradual and uniform shrinkage in milk solids through all the periods, due to the advance in time of lactation, the fact that the cows all lost weight in Period II and gained again, with the exception of No. 4, in Period III, furnishes good grounds for the above statement.

EXPERIMENT II.

Ensilage composed of mature flint corn, sunflower heads and Peas as food for milch cows.

When this experiment was planned it was the intention to use the so called Robertson Mixture of corn, sunflower heads and horse beans, but as no horse beans could be procured in time for planting, Blackeyed peas were substituted. The peas were sown quite late that they might not mature too early for the corn and sunflowers. The materials were all harvested and put in the silo at the proper stage of maturity, the latter part of September. The last of February the silo was opened and the silage found to be in most excellent condition, being perfectly preserved and when fed was much relished by the stock.

The object of making the mixture was to secure a more nearly balanced ration than is furnished by corn alone. The peas were added to increase the protein and the sunflower heads the protein and fat, the seeds being very rich in oil.

Every farmer is well aware of the great efficiency of a pasture grass ration,and if we can therefore produce a succulent food for winter use that will approach approximately the composition and digestibiltiy of pasture grass,we shall be able in part to substitute it for the grain now fed and thereby save something of the enormous outlay expended by farmers for that purpose.

It is perhaps true that just at the present time protein can be more cheaply purchased in cotton seed meal than it can be produced on an Eastern farm, but the time is not far distant when we may expect to see that most excellent food very materially advance in price. The Southern and Western farmers are beginning already to appreciate its value and are feeding large quantities to stock, and we have every reason to believe that this practice will increase with the constantly growing dairy interests of those regions.

The details of the experiment are given in the following tables.

It will be noticed that the grain ration fed the first Period was light but was thought to be sufficient with the amount of ensilage used and just the reason why in the first period some of the cows should lose in weight and maintain their milk flow and then gain in weight and lose in milk flow during the second period, is not apparent unless the changes were due to variation in the stomach and intestinal contents at the times of weighing rather than any actual gain or loss in flesh.

TABLE XV.

	Fine hay—pounds.	Corn meal—pounds.	Cotton seed meal—pounds.	Bran—pounds.	Ensilage—pounds.
Ration I	10	3	1 1-2	1 1-2	30
Ration II	10 4-7	....	... .	....	50
Ration III	10	1-2	3-4	3-4	50

TABLE XVI.

FOOD CONSUMED BY THE FIVE COWS IN EACH PERIOD.

Period I.		Period II.		Period III.		Period IV.		Period V.	
	Pounds.		Pounds.		Pounds.		Pounds.		Pounds.
Hay	700	Hay	740	Hay	700	Hay	700	Hay	700
Silage	2,100	Silage	3,500	Silage	2,100	Silage	3,500	Silage	2,100
Corn meal,	210			Corn meal,	210	Corn meal	105	Corn meal	210
C. S. meal.	105			C. S. meal.	105	C. S. meal,	52½	C. S. meal,	105
Bran	105			Bran	105	Bran	52½	Bran	105

TABLE XVII.

COMPOSITION OF FOODS USED.

	Water—per cent.	Ash—per cent.	Protein—per cent.	Fiber—per cent.	Nitrogen free-extract—per cent.	Fats—per cent.
Hay—bluegrass	5.10	4.92	6.81	30.00	49.78	3.39
Corn meal	14.98	1.42	9.17	1.90	68.76	3.77
Cotton seed meal	8.17	7.17	42.31	5.62	23.68	13.08
Bran	11.91	5.78	15.42	8.99	53.87	4.03
Silage	76.31	1.81	2.89	5.56	12.17	1.26

TABLE XVIII.

TOTAL AND DIGESTIBLE NUTRIENTS CONSUMED BY EACH COW FOR EACH PERIOD.

	Period I. Pounds.	Period II. Pounds.	Period III. Pounds.	Period IV. Pounds.	Period V. Pounds.
(Total.)					
Protein	37.65	30.28	37.65	37.72	36.32
Carbohydrates	237.22	242.34	237.22	261.32	229.31
Fat	14.20	13.80	14.20	16.13	13.91
Total organic matter	289.07	286.42	289.07	315.17	279.54
Eaten daily	20.6	20.4	20.6	22.5	19.9
(Digestible.)					
Protein	26.17	18.80	26.17	24.92	24.39
Carbohydrates	165.40	166.87	165.40	183.46	157.95
Fat	11.80	10.79	11.80	12.05	11.39
Total organic matter	203.37	196.46	203.37	220.43	193.73
Eaten daily	14.5	14.0	14.5	15.7	13.8
Nutritive ratio	1 to 7.33	1 to 10.02	1 to 7.33	1 to 8.45	1 to 7.53

TABLE XIX.

AVERAGE AMOUNT OF WATER DRANK DAILY BY EACH COW.

	1. Pounds.	2. Pounds.	3. Pounds.	5. Pounds.	6. Pounds.
Period I	35	38	48	29	37
Period II	26	38	46	37	35
Period III	36	47	61	48	44
Period IV	43	49	62	47	47
Period V	44	49	61	47	4

TABLE XX.

AVERAGE COMPOSITION OF MILK FOR LAST FIVE DAYS OF EACH PERIOD.

Cows.	1.		2.		3.		5.		6.	
	Solids—%.	Fat—%.	Solids—%.	Fat—%.	Solids—%.	Fat—%.	Solids—%.	Fat—%.	Solids—%.	Fat—%.
Period I	13.78	4.33	14.18	5.04	12.87	4.13	12.57	4.07	14.80	5.27
Period II	13.50	4.26	13.77	4.78	12.42	3.98	12.38	3.67	15.04	5.42
Period III	13.36	4.19	14.25	4.97	12.99	3.97	12.29	4.07	14.39	4.84
Period IV	13.81	4.31	14.36	4.81	13.19	3.94	12.74	4.07	14.33	5.05
Period V	13.81	4.44	14.77	5.04	13.87	4.39	12.88	4.25	13.95	4.74

TABLE XXI.

TEMPERATURE OF STABLE AND YIELD OF MILK FOR EACH COW PER WEEK.

	Temperature of stable—Fahrenheit.	MILK PRODUCED BY COWS.				
		1. Lbs.	2. Lbs.	3. Lbs.	5. Lbs.	6. Lbs.
March 16 to March 29.						
First week	45°	97.8	102.9	137.7	159.4	123.1
Second week	50°	102.5	107.4	136.1	151.6	124.4
March 30 to April 12.						
First week	50°	91.3	92.4	121.3	135.6	121.6
Second week	52°	88.3	90.8	113.0	131.5	108.3
April 13 to April 27.						
First week	54°	86.8	94.3	119.0	143.8	125.1
Second week	58°	101.0	106.0	123.6	145.9	139.9
May 4 to May 17.						
First week	70°	100.9	97.0	110.9	140.8	133.6
Second week	63°	102 3	104.6	113.3	141.3	137.3
May 18 to May 31.						
First week	58°	101.9	98.9	102.9	138.1	130.9
Second week	65°	105.3	101.5	94.8	135.6	145.6

TABLE XXII.

WEIGHT OF COWS—GAIN AND LOSS IN WEIGHT—POUNDS OF MILK, SOLIDS AND FAT PRODUCED BY EACH COW FOR EACH PERIOD.

	Number cow.	Weight of cow—pounds.	Gain in weight—pounds.	Loss in weight—pounds.	Milk—pounds.	Solids—pounds.	Fat—pounds.
Period I. 14 days.	1	922	4	...	200.3	27.6	8.67
	2	923	...	23	210.1	29.8	10.60
	3	857	...	14	273.8	35.3	11.34
	5	708	7	...	311.0	39.1	12.66
	6	875	...	7	247.5	36.6	13.05
Total ...	...	...	11	44	1,242.7	168.4	56.32
Daily yield ...	...	...	...	...	17.8	2.41	.81
Period II. 14 days.	1	926	...	3	179.5	24.9	7.65
	2	896	22	...	183.4	25.2	8.76
	3	843	9	...	234.3	29.1	9.32
	5	715	2	...	267.1	33.1	9.80
	6	868	...	15	229.9	32.7	12.45
Total ...	...	...	33	18	1,094.2	145.0	47.98
Daily yield ...	...	...	...	...	15.6	2.07	.685
Period III. 14 days.	1	923	15	...	187.8	25.1	7.87
	2	918	7	...	200.3	28.00	9.55
	3	852	...	12	242.6	31.50	9.63
	5	717	3	...	289.6	36.9	11.80
	6	853	...	8	265.0	38.1	12.83
Total ...	...	...	25	20	1,185.3	159.6	51.64
Daily yield ...	...	...	...	...	17.0	2.28	.74
Period IV. 14 days.	1	938	10	...	203.2	28.1	8.77
	2	925	3	...	201.6	29.0	9.70
	3	840	14	...	224.1	29.6	8.82
	5	720	2	...	282.0	35.9	11.48
	6	845	12	...	270.9	38.8	13.70
Total ...	...	...	41	...	1,181.8	161.4	52.47
Daily yield ...	...	...	...	...	16.9	2.36	.75
Period V. 14 days.	1	952	12	...	207.1	28.6	9.20
	2	929	13	...	200.4	29.6	10.10
	3	860	5	...	197.6	27.4	8.68
	5	723	...	16	273.8	35.3	11.60
	6	862	23	...	276.6	38.6	13.10
Total ...	...	...	53	16	1,155.5	159.5	52.68
Daily yield ...	...	...	...	...	16.5	228.0	.75

TABLE XXIII.

TOTAL AND DIGESTIBLE NUTRIENTS EATEN FOR EVERY POUND OF MILK, SOLIDS, AND FAT PRODUCED.

	Period I—lbs.	Period II—lbs.	Period III—lbs.	Period IV—lbs.	Period V—lbs.
(Total Nutrients.)					
Milk	1.15	1.31	1.22	1.13	1.21
Solids	8.53	9.87	9.05	9.78	9.44
Fat	25.5	29.8	27.98	30.04	28.6
(Digestible Nutrients.)					
Milk	.82	.90	.86	.93	.84
Solids	6.04	6.77	6.37	6.83	6.07
Fat	18.10	20.50	19.70	21.02	18.40

From the data presented in the preceding tables we are warranted in making the following summary.

1st. That the materials composing the silage used can be perfectly preserved and successfully kept in the silo as late as June of the following year.

2nd. That the pea, sunflower and corn mixture produces a silage somewhat richer in protein than corn alone and is very greedily eaten by stock.

3rd. That to attempt to substitute this mixture entirely for the grain ration was not a success as shown by Table XXII, the cows shrinkng quite materially in their flow of milk without an increase in its richness. The shrinkage was undoubtedly due to a lack of digestible protein as will be seen by consulting Table XVIII; the total and digestible organic matter consumed was practically the same but the protein was considerably less than in Period I. On returning to the grain and silage ration in Period III the flow of milk was increased to nearly the original yield.

4th. In Period IV silage was substituted for one-half the grain ration, twenty pounds silage for three pounds grain, with good results. All the cows increased in weight and shrank no more in milk than would be expected from the advance in time of lactation, the solids and fat increasing slightly.

THE RELATION OF FOOD TO THE GROWTH AND COMPOSITION OF THE BODIES OF STEERS.*

W. H. Jordan.

General Considerations.

The problems pertaining to animal nutrition are among the most difficult of solution of any that confront the investigator. This is due largely to the fact that many of the phenomena, chemical and physical, which occur in the animal organism and that are involved in the processes of growth, are hidden from the ordinary means of observation. An animal eats, digests and assimilates food and as a result uses energy and forms tissues of various kinds. We know that in some way the food supplies the materials for growth,but such questions as the nutritive office of the single compounds of the food and the effect upon the animal of varying these compounds in their relative quantities, are so far partially answered. Such information as we do possess along these lines has been obtained partly by circumstantial rather than by direct evidence, and many conclusions have been inferential in their nature and are not the outcome of direct testimony. Only investigations long continued and of the most searching kind are competent to reveal the nature and extent of the chemical and physical changes in the animal body. The ordinary practical feeding experiments, while they may furnish guides for practice, explain none of these troublesome problems. If one animal increases in weight more rapidly on one food mixture than another animal does on a widely different ration we simply know the fact. The explanation of the fact we may infer with a fair chance of a wrong inference in some cases. First of all we are not sure that the actual growth is proportional to the increase in weight, although where the experiment covers a long period of time it is reasonable to assume that such is the case. Again, granting that great differences in actual growth of tissue actualy exist, we cannot now fully explain, perhaps never can, in what way the food is responsible for these differences. The need of fuller knowledge concerning the fundamental facts of digestion and metabolism is a

* Analyses performed by J. M. Bartlett and L. H. Merrill,—the animals in care of A. M. Shaw.

pressing one and the investigator who is using the respiration apparatus and other scientific facilities in a search for this knowledge has before him great possibilities for valuable service. But this lack of knowledge does not constitute a reason why observations of a practical character should not be continued. Feeding experiments may convince us of certain facts which science shall sometime explain. We should demand, however, that the conclusions derived from these experiments shall be fortified by all the accurate data which it is possible to secure, and so in studying the relation of food to growth, it is essential to know not only the amount and kind of nutrients supplied to the animals but also the extent and character of the growth produced.

The Problem Studied.

There is much discussion at the present time, of the relative influence and economy of various food combinations. "Standard rations," "narrow ratio" and "wide ratio" are familiar phrases, all of which have to do with a wide spread conviction that the manner in which foods of different classes are combined has much to do with the character of the product and the profit of feeding animals.

It is generally taught that a given amount of digestible food should have not less than a certain proportion of protein in order that it may cause a maximum production, and scientific data, practical feeding experiments and even common experience appear to warrant such teaching. It is claimed, still further, that not only the amount but the kind of product is to an extent under the control of the food, and the experiments of Sanborn, Henry, Roberts and Georgeson with swine, lambs and steers appear to substantiate this claim, certainly so far as it relates to swine.

In all these experiments the evidence of the effect of the food in modifying the composition of the carcass is simply the apparent relative amount of the fat and lean tissues, save in certain instances where a chemical analysis was made of a portion of the carcasses, too small to furnish reliable data. With the swine in some cases the differences in the carcasses in their proportions of lean and fat were too unmistakable to allow an erroneous judgment, but with the sheep and steers no past experiments seem to have been so conducted as to prove that the rations differed in effect other than to cause more growth or less growth. Moreover, the experiments with ruminants for the purpose of studying the effect of food upon the kind of growth were not begun with the young animals and continued until they reached a somewhat mature growth, but covered only such periods of time as would be required to fatten the animals for the market.

The experiment which is detailed in the following pages had for its object a study of the effect of widely different rations upon the rate of growth and composition of the bodies of steers, and it is believed in that two particulars it is a distinct improvement upon similar experiments previously conducted: (1) The feeding was begun with the animals as calves and continued from seventeen to twenty-seven months or until the steers had attained a size from 870 to 1300 pounds. (2) The bodies of the animals, excepting the skins, were entirely submitted to chemical analysis.

Plan of the Experiment.

Character of the steers. Four steer calves were purchased in the summer of 1893 of R. & C. D. Waugh, Starks, Me., and they reached the station on June 7th. Their breeding is described in the following extract from a letter from the Messrs. Waugh. "The men that raised the calves have kept thoroughbred Durham bulls for over forty years, and they are high grades."

The calves were therefore not full blooded animals but were high Shorthorn grades, and were quite uniform in quality. One pair was two or more months older than the other two, and in dividing the animals into two lots one older and one younger animal were assigned to each lot. At the time when the experimental feeding began the age of the calves ranged from five to seven months.

The rations. The steers were fed alike until the last week of August, 1893, at which time the feeding of the experimental rations begun. On September 1st, the animals were weighed for the first time and from that date a record of the daily rations and weekly changes in live weight was kept until the end of the experiment.

The grain rations consisted of mixed grains with both lots. At first Steers 1 and 2 were fed a mixture consisting of one part linseed meal one part corn meal and one part wheat bran, by weight.This mixture was continued until January 22, 1894, when it was changed to one consisting of two parts linseed meal, one part corn meal and one part wheat bran, which was continued throughout the remainder of the experiment. Steers 3 and 4 were fed during the entire experiment on a grain mixture consisting of two parts corn meal and one part wheat bran, by weight.

The coarse food consisted entirely of hay, except in the winter 1893-4 when corn fodder and corn silage were also fed. At no time was the daily ration what would be considered heavy feeding. The object of the experiment was to discover the specific effect of quite different rations rather than to produce the largest possible animals within a given time, and to this end the rations were restricted to a moderate quantity, on the ground that less vicissitudes would attend the experiment and that any thing approaching an excess of food would tend to obscure the influence of a more or less favorable combination of nutrients.

At the beginning, the daily ration was five pounds of hay or its equivalent and one pound of mixed grain, and the largest ration fed to any steer during the entire experiment was thirteen pounds of hay and eight pounds of grain. Considering the small amount of food eaten, the growth of the animals was very satisfactory.

As can be readily seen, neither of the rations fed can be considered as unusual. Neither one is unlike what might be found in the practice of many cattle feeders. Neither one includes extraordinary materials or proportions of nutrients. The one was compounded to a nutritive ratio not unlike the German standard rations for growing animals, and the other was made up so as to represent what is called a "wide ration." Both rations were consistent with health and a normal development of the animals and doubtless both would be included within the limits of good practice, if these limits are to be bounded by the extremes of opinion among practical feeders.

The essential difference between the two rations lies in the marked difference in the proportions of protein which they contained, and the discussion of results centers around this fact. Certainly it cannot be claimed in either case that there was a deficiency of bone making material or that any other especially abnormal condition prevailed.

The manner of the experiment. Throughout the entire time the steers were stall fed, mostly, as previously stated, upon dry food. During all seasons they were allowed exercise in a large yard, excepting during rain storms or the severest winter days. The food was weighed out daily and the animals were weighed on three consecutive days of each week, the averages of these three weighings being taken as the actual weights. The grains were not weighed out separately on each day, but were mixed in large quantities, the total daily ration being obtained by a single weighing. Each new mixture of grains was sampled and the samples were submitted to chemical analysis. Analyses were also made of the corn fodder and silage eaten, but not of the hay.

It is a matter for congratulation that the experiment progressed in an unusually satisfactory manner. The animals were continuously in good health and no accidents or disturbances of any kind occurred to mar the success of the work, which, considering that the experiment covered more than two years time, must be regarded as a piece of good fortune.

In January and February 1895 two animals, one from each lot, Nos. 1 and 4, were killed and analyzed. These steers had been fed experimentally about seventeen months and weighed 958 and 870 pounds respectively. The other two animals, Nos. 2 and 3 were fed for more than ten months longer or until during December 1895 and weighed when slaughtered 1300 and 1280 pounds. These latter animals had been fed therefore over twenty-seven months.

As the animals were slaughtered, the blood, the various organs and the carcasses were weighed and all these parts were immediately prepared for analysis, the main object of the experiment being to determine the actual quantities of ash, protein and fats that had been produced in the bodies of the several steers.

The food. The grains were purchased in the Bangor market. The hay fed was mostly timothy and was nearly all raised on the College Farm. The corn fodder and silage were also from corn produced by the experiment station in 1893.

The composition and digestibility of the foods. As before stated the grains were mixed in large lots and samples were taken for analysis. No analyses were made of the particular hay eaten, but it is assumed to have a composition similar to the average composition of the hay produced on the College Farm during five previous seasons.*

The corn fodder and silage are assumed to have the same composition as the entire lots of southern corn and field corn for the year 1893.**

Table XXIV shows the composition of various foods.

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* See Report Maine Experiment Station, 1889, p. 39.

** See Report Maine Experiment Station, 1893, p. 27.

TABLE XXIV.

COMPOSITION OF THE FOODS.

	Composition as Fed.					
	Water.	Ash.	Protein.	Fiber.	Nitrogen free-extract.	Fats.
	%	%	%	%	%	%
Hay (assumed)	13.0	4.12	6.76	28.55	44.66	2.91
Southern corn fodder (or silage)	84.0	1.2	1.8	4.4	8.2	.4
Field corn fodder (or silage)	80.5	1.2	2.4	4.1	11.3	.5
Mixed grains, fed steers 1 and 2:						
Lot mixed August 25, 1893	11.34	3.98	19.37	6.07	53.51	5.73
December 20, 1893	11.25	4.28	21.43	6.71	51.16	5.17
January 22, 1894	11.32	4.55	25.18	7.48	45.93	5.54
February 23, 1894	10.90	4.87	24.62	7.77	46.70	5.14
April 4, 1894	10.95	4.81	25.18	7.19	46.84	5.03
June 16, 1894	10.56	4.52	26.06	7.02	48.35	3.49
August 22, 1894	9.88	4.61	25.94	7.25	48.38	3.94
October 20, 1894	9.84	4.29	25.35	7.11	48.97	4.44
December 31, 1894	12.54	4.10	24.19	7.49	48.58	3.10
February 4, 1895	14.15	4.19	23.44	7.38	48.32	2.52
April 30, 1895	11.67	4.17	27.44	7.37	47.15	2.20
June 11, 1895	10.76	4.18	26.62	7.21	47.79	3.44
Average	11.2	4.4	24.6	7.2	48.5	4.1
Mixed grains, fed steers 3 and 4:						
Lot mixed August 25, 1893	12.79	3.20	11.75	3.84	63.73	4.69
December 20, 1893	12.39	2.70	11.90	4.42	64.34	4.25
February 23, 1893	11.94	3.39	11.50	4.71	64.01	4.45
April 4, 1893	11.65	3.35	12.68	4.87	62.80	4.65
June 16, 1893	11.02	3.30	11.87	4.62	66.43	2.76
August 22, 1893	10.47	2.91	12.25	4.26	65.44	4.67
October 20, 1893	10.34	2.50	12.06	3.91	66.91	4.28
Average	11.5	3.1	12.00	4.4	64.8	4.2

The digestion coefficients used are stated below and are the averages of German and American results in the case of the corn meal and linseed meal, and the American averages alone for the bran, hay and silage. The coefficients for the mixtures are calculated from the coefficients of the single grains.

TABLE XXV.

	Digestion Coefficients.			
	Protein.	Fiber.	Carbo-hydrates.	Fats.
Hay—average for Timothy, all kinds	49	53	63	57
Corn fodder and silage, field corn	63	75	77	83
Southern corn	49	71	66	75
Grain mixture, Steers 1 and 2	80	50	78	85
Steers 3 and 4	73	47	85	82

EFFECT OF THE TWO RATIONS UPON THE INCREASE OF LIVE WEIGHT.

The grain mixtures which the steers received were in the following proportions:

STEERS 1 AND 2.
Linseed meal, 2 parts.
Corn meal, 1 part.
Wheat bran, 1 part,

STEERS 3 AND 4.
Corn meal, 2 parts.
Wheat bran, 1 part.

The coarse foods consisted of hay, with more or less silage during the first winter.

The quantities of grain fed daily were alike for all steers, excepting slight differences during the first few weeks. The amounts of coarse foods eaten daily differed somewhat with the several animals being least for Steer 1, most for Steer 2 and alike for steers 3 and 4.

From the preceding data have been calculated the quantities of food and amounts of dry and digestible material consumed by the several steers.

This has been done not only for the entire time that the steers were fed, but also for the first fifteen months in periods of three months each. There is shown also the nutritive ratios of the rations and the relations between food consumed and the gain in live weight.

The tables which immediately follow are as follows:

Table XXVI to XXIX. The foods eaten and gains of live weight by periods of four to six weeks for the entire experiment.

Table XXX. Summary of Tables 1 to 4.

Table XXXI. Dry matter and digestible matter eaten by the four steers during the entire experiment, with relation of food to growth.

Table XXXII. Summary of Table VI.

Table XXXIII. Dry and digestible matter eaten by the four steers during the first fifteen months of the experiment, considered in five periods, with relation of food to growth.

Table XXXIV. Daily food consumption and growth of steers during first fifteen months of the experiment, considered in five periods.

TABLE XXVI.

FOODS EATEN AND GAINS OF LIVE WEIGHT.—ENTIRE EXPERIMENT.

STEER 1.

Dates.	No. of days.	Food Eaten. Hay—pounds.	Food Eaten. Silage or corn fodder—pounds.	Food Eaten. Grain mixture—pounds.	Weight. Initial—pounds.	Weight. End—lbs.	Weight. Grain—pounds.
1893, September 1—28	28	... ..	*616	31.5	221	257	36
September 28—October 26	28	109	*214	45.5	257	279	22
October 26—November 30	35	228	....	81.5	279	327	48
November 30—December 28	28	196	....	82	327	363	36
December 28—January 25	28	136	†300	98	363	397	34
1894, January 25—February 22	28	56	†700	111	397	447	50
February 22—March 29	35	70	‡875	140	447	514	67
March 29—April 26	28	56	‡608	112	514	544	30
April 26—May 31	35	148	†860	140	544	630	86
May 31—June 28	28	280	....	112	630	681	51
June 28—July 26	28	280	....	112	681	707	26
July 26—September 6	42	420	....	193	707	758	51
September 6—October 4	28	280	....	140	758	803	45
October 4—November 1	28	280	....	144	803	851	48
November 1—December 6	35	350	....	249	851	903	52
December 6—January 3	28	280	....	224	903	935	32
1895, January 3—January 28	24½	245	....	196	935	958	23
Totals	514.5	3,414	4,173	2,211	......	......	737

* Field corn. † Southern corn silage. ‡ Field corn silage.

TABLE XXVII.

FOOD EATEN AND GAINS OF LIVE WEIGHT—ENTIRE EXPERIMENT.

STEER 2.

Dates.	No. of days.	Food Eaten.			Weights.		
		Hay—lbs.	Corn fodder or silage—pounds.	Mixed grains—pounds.	Initial—pounds.	End—lbs.	Gain—lbs.
1893, September 1—28	28	......	*963	29.5	345	398	53
September 28—October 26	28	147	*315	43.5	398	424	26
October 26—November 30	35	280	....	81.5	424	451	27
November 30—December 28	28	224	....	61	451	482	31
December 28—January 25	28	161	†300	98	482	512	30
1894, January 25—February 22	28	84	†700	111	512	563	51
February 22—March 29	35	105	‡875	140	563	625	62
March 29—April 26	28	88	‡700	112	625	675	50
April 26—May 31	35	183	†875	140	675	749	74
May 31—June 28	28	308	....	112	749	782	33
June 28—July 26	28	308	....	112	782	812	30
July 26—September 6	42	462	....	193	812	860	48
September 6—October 4	28	308	....	140	860	897	37
October 4—November 1	28	308	....	144	897	920	23
November 1—December 6	35	385	....	249	920	958	38
December 6—January 3	28	308	....	224	958	987	29
1895, January 3—January 31	28	308	....	224	987	1,023	36
January 31—February 28	28	308	....	224	1,023	1,040	17
February 28—March 28	28	308	....	224	1,040	1,075	35
March 28—April 25	28	308	....	224	1,075	1,105	30
April 25—May 30	35	385	....	280	1,105	1,140	35
May 30—June 27	28	308	....	224	1,140	1,158	18
June 27—August 1	35	385	....	280	1,158	1,185	27
August 1—August 29	28	308	....	224	1,185	1,223	38
August 29—September 26	28	369	....	224	1,223	1,255	32
September 26—October 31	35	455	....	280	1,255	1,268	13
October 31—November 28	28	364	....	224	1,268	1,307	39
November 28—December 23	24½	318½	....	196	1,307	1,300	—7
Totals	843.5	7783.5	4,728	4,818.5	......	... .	969

* Field corn. † Southern corn silage. ‡ Field corn silage.

TABLE XXVIII.

FOODS EATEN AND GAINS OF LIVE WEIGHT—ENTIRE EXPERIMENT.

STEER 3.

DATES.	No. of days.	FOOD EATEN. Hay—lbs.	Corn fodder or silage—pounds.	Grain mixture—pounds.	WEIGHTS. Initial—pounds.	End—lbs.	Gain—pounds.
1893, September 1—September 28	28	....	*782	29	285	309	24
September 28—October 26	28	128	*261.5	45.5	309	331	22
October 26—November 30	35	245	....	81.5	331	361	30
November 30—December 28	28	196	....	82	361	389	28
December 28—January 25	28	136	†300	98	389	410	21
1894, January 25—February 22	28	56	†700	111	410	453	43
February 22—March 29	35	70	‡875	140	453	509	56
March 29—April 26	28	56	‡700	112	509	559	50
April 26—May 31	35	148	†875	140	559	621	62
May 31—June 28	28	280	....	112	621	661	40
June 28—July 26	28	280	....	112	661	701	40
July 26—September 6	42	420	....	193	701	750	49
September 6—October 4	28	280	....	140	750	780	30
October 4—November 1	28	280	....	144	780	801	21
November 1—December 6	35	350	....	249	801	862	61
December 6—January 3	28	280	....	224	862	875	13
1895, January 3—January 31	28	280	....	224	875	913	38
January 31—February 28	28	280	....	224	913	950	37
February 28—March 28	28	280	....	224	950	994	44
March 28—April 25	28	280	....	224	994	1,036	42
April 25—May 30	35	350	....	280	1,036	1,080	44
May 30—June 27	28	280	....	224	1,080	1,114	34
June 27—August 1	35	350	....	280	1,114	1,127	13
August 1—August 29	28	280	....	224	1,127	1,163	36
August 29—September 26	28	332	....	224	1,163	1,208	45
September 26—October 31	35	420	....	280	1,208	1,248	40
October 31—November 28	28	336	....	224	1,248	1,290	42
November 28—December 10	11½	138	....	92	1,290	1,280	10
Totals	833.5	6,811	4,493.55	4,737	......	.....	1,015

* Field corn. † Southern corn silage. ‡ Field corn silage.

TABLE XXIX.

FOODS EATEN AND GAINS OF LIVE WEIGHT—ENTIRE EXPERIMENT.

STEER 4.

Dates.	No. of days.	Food Eaten.			Weights.		
		Hay—lbs.	Fodder or silage—pounds.	Mixed grains—pounds.	Initial—pounds.	End—pounds.	Gain—pounds.
1893, September 1—September 28......	28	......	*763	29.5	318	338	20
September 28—October 26	28	128	*256	35.5	338	366	38
October 26—November 30.... ..	35	245	....	81.5	366	385	19
November 30—December 28......	28	196	....	82	385	401	16
December 28—January 25	28	136	†300	98	401	424	23
1894, January 25—February 22.........	28	56	†700	111	424	468	44
February 22—March 29...........	35	70	‡875	140	468	525	57
March 29—April 26................	28	56	‡700	112	525	573	48
April 26—May 31	35	148	†875	140	573	628	55
May 31—June 28................ .	28	280	....	112	628	680	52
June 28—July 26.	28	280	....	112	680	702	22
July 26—September 6.....	42	420	....	193	702	725	23
September 6—October 4	28	280	....	140	725	738	13
October 4—November 1...........	28	280	....	144	738	776	38
November 1—December 6.... ...	35	350	....	249	776	815	39
December 6—January 3	28	280	....	224	815	846	31
1895, January 3—January 31............	28	280	....	224	846	894	48
January 31—February 4	35	35	....	28	894	870	24
Totals.........	5,215	3,520	4,469	2,255.5			600

* Field corn. † Southern corn silage. ‡ Field corn silage.

TABLE XXX.

SUMMARY SHOWING TOTALS OF FOODS EATEN AND GAINS MADE BY THE FOUR STEERS DURING ENTIRE EXPERIMENT.

	LOT 1. PROTEIN—RICH FOOD.		LOT 2. PROTEIN—POOR FOOD.	
	Steer 1.	Steer 2.	Steer 3.	Steer 4.
Number of days fed	514	843	833	521
Total hay eaten—pounds	3,414	7,783	6,811	3,520
Total fodder and silage eaten—pounds	4,173	4,728	4,493	4,469
Total mixed grains eaten—pounds	2,211	4,818	4,737	2,255
Total food eaten—pounds	9,700	17,329	16,041	10,234
Initial weights of steers—pounds	221	345	285	318
End weights of steers—pounds	958	1,307	1,290	870
Total gain of each steer—pounds	737	962	1,005	552

TABLE XXXI.

DRY MATTER AND DIGESTIBLE MATTER EATEN BY THE FOUR STEERS DURING THE ENTIRE EXPERIMENT, WITH RELATION OF FOOD TO GROWTH.

	Dry Matter Eaten.				Digestible Matter Eaten.					
	Protein—pounds.	Carbo-hydrates—pounds.	Fat—pounds.	Total—pounds.	Protein—pounds.	Carbo-hydrates—pounds.	Fat—pounds.	Total—pounds.	Nutritive ratio.	Digestible matter eaten for each lb. gain of live w't.
Protein—rich ration.										Lbs.
STEER 1.										
In silage, 4,173 pounds .	89.0	590.6	19.0	698.6	51.4	431.3	15.2	497.9		
In hay, 3,414 pounds...	230.7	2499.4	99.3	2829.4	113.0	1476.9	56.7	1646.6		
In grains, 2,211 pounds.	568.0	1290.2	103.3	1961.5	454.3	961.2	87.8	1503.3		
Total in 514 days....	887.7	4380.2	221.6	5489.5	618.7	2869.4	159.7	3647.8	......	4.95
Eaten daily............	1.73	8.52	.43	10.78	1.20	5.58	.32	7.10	1:5.2	
Protein—Poor ration.										
STEER 4.										
In silage, 4,469 pounds .	96.0	635.8	20.5	752.3	55.1	465.6	16.4			
In hay, 3,520 pounds...	237.6	2577.3	102.4	2917.3	116.0	1522.7	57.9			
In grains, 2,255 pounds.	272.9	1553.5	96.6	1923.0	199.2	1275.5	79.2			
Total in 521 days....	606.5	4766.6	219.5	5592.6	370.3	3263.8	153.5	3787.6	.. ...	6.86
Eaten daily	1.16	9.15	.42	10.73	.71	6.26	.30	7.27	1:9.7	
Protein—rich ration.										
STEER 2.										
In silage, 4,728 pounds .	102.2	675.6	21.7	799.5	59.7	487.9	17.4	565.0		
In hay, 7,783 pounds....	526.1	5698.1	226.6	6450.8	257.5	3366.9	129.2	3753.6		
In grains, 4,818 pounds.	1185.2	2685.3	205.1	4075.6	948.2	1997.9	174.3	3120.4		
Total in 843 days....	1813.5	9059.0	453.4	11325.9	1265.4	5852.7	320.9	7439.0	......	7.73
Eaten daily	2.15	10.74	.54	13.43	1.50	6.95	.38	8.83	1:5.2	
Protein—poor ration.										
STEER 3.										
In silage, 4,493 pounds .	96.6	639.5	20.6	756.7	56.1	468.4	16.5	541.0		
In hay, 6,811 pounds....	460.4	4986.3	198.8	5645.5	225.3	2946.4	113.0	3284.7		
In grains, 4,737 pounds.	573.0	3284.8	201.4	4059.2	418.3	2713.6	165.2	3297.1		
Total in 833 days....	1130.0	8910.6	420.8	10461.4	699.7	6128.4	294.7	7122.8	......	7.08
Eaten daily..	1.36	10.69	.50	12.55	.84	7.36	.35	8.55	1:9.7	

TABLE XXXII.

SUMMARY OF TABLE XXXI.

	Daily gain in live weight—pounds.	Dry Matter Eaten Daily.				Digestible Material Eaten Daily.				Nutritive ratio.	Digestible matter eaten for each pound gain of live weight—pounds.
		Protein—pounds.	Carbo-hydrates—pounds.	Fats—pounds.	Total—pounds.	Protein—pounds.	Carbo-hydrates—pounds.	Fats—pounds.	Total—pounds.		
Protein—rich food.											
Steer 1, fed 514 days ...	1.43	1.73	8.52	.43	10.78	1.20	5.58	.32	7.10	1:5.2	4.95
Steer 2, fed 843 days ...	1.14	2.15	10.74	.54	13.43	1.50	6.95	.38	8.83	1:5.2	7.73
Protein—poor food.											
Steer 3, fed 521 days ...	1.06	1.16	9.15	.42	10.73	.71	6.26	.30	7.27	1:9.7	6.86
Steer 4, fed 833 days ...	1.20	1.36	10.69	.50	12.55	.84	7.36	.35	8.55	1:9.7	7.08

TABLE XXXIII.

DRY AND DIGESTIBLE MATTER EATEN BY THE FOUR STEERS, DURING THE FIRST FIFTEEN MONTHS OF THE EXPERIMENT, CONSIDERED IN FIVE PERIODS, WITH RELATION OF FOOD TO GAIN.

	Dry Matter Consumed in Entire Periods.				Digestible Matter Consumed in Entire Periods.				Total gain in period—pounds.	Digestible food eaten per pound of gain—pounds.
	Protein—pounds.	Carbo-hydrates—pounds.	Fat—pounds.	Total—pounds.	Protein—pounds.	Carbo-hydrates—pounds.	Fat—pounds.	Total—pounds.		
Period 1. 91 days—Sept. 1 to Nov. 30, 1893.										
Steer 1	73.4	469.0	23.0	565.4	48.3	314.6	16.7	379.6	106	3.58
Steer 2	89.5	601.5	27.6	718.6	57.4	405.0	19.9	482.3	106	4.55
Steer 3	68.5	538.92	23.4	630.8	41.4	371.4	16.5	429.3	76	5.65
Steer 4	66.8	528.7	22.8	618.3	40.3	363.2	17.1	420.6	67	6.28
Period 2. 84 days—Dec. 1 to Feb. 22, 1894.										
Steer 1	109.1	574.9	31.2	715.2	73.5	377.9	22.9	474.3	120	3.95
Steer 2	114.5	634.2	33.5	782.2	76.2	412.8	24.3	513.3	112	4.58
Steer 3	78.3	606.2	29.0	713.5	46.5	415.7	20.7	482.9	92	5.25
Steer 4	78.3	606.2	29.0	713.5	46.5	415.7	20.7	482.9	83	5.82
Period 3. 98 days—Feb. 23 to May 31, 1894.										
Steer 1	167.6	749.8	38.6	956.0	117.4	524.2	30.1	671.7	183	3.67
Steer 2	117.0	840.5	42.1	1059.6	122.4	579.8	32.2	724.4	186	3.94
Steer 3	120.7	820.2	37.1	978.0	76.1	607.7	29.5	713.3	168	4.25
Steer 4	120.7	820.2	37.1	978.0	76.1	607.7	29.5	713.3	160	4.46
Period 4. 98 days—June 1 to Sept. 6, 1894.										
Steer 1	174.1	946.6	44.8	1165.5	118.7	594.5	30.1	743.3	128	5.80
Steer 2	180.7	1018.4	47.6	1246.7	121.9	636.8	31.7	790.4	111	7.11
Steer 3	117.0	1009.9	42.2	1169.1	69.5	665.1	27.5	762.1	129	5.90
Steer 4	117.0	1009.9	42.2	1169.1	69.5	665.1	27.5	762.1	97	7.85
Period 5. 91 days—Sept. 7 to Dec. 6, 1894.										
Steer 1	198.3	963.8	48.5	1210.6	139.6	615.2	33.8	788.6	145	5.44
Steer 2	204.5	1030.8	51.1	1286.4	142.6	654.5	35.3	832.4	98	8.50
Steer 3	126.3	1029.1	50.6	1206.0	77.4	693.7	34.9	806.0	112	7.20
Steer 4	126.3	1029.1	50.6	1206.0	77.4	693.7	34.9	806.0	90	8.96

TABLE XXXIV.

DAILY FOOD CONSUMPTION AND GROWTH OF STEERS DURING FIRST FIFTEEN MONTHS OF THE EXPERIMENT, CONSIDERED IN FIVE PERIODS.

		Dry Matter Consumed Daily.				Digestible Matter Consumed Daily.				
		Protein—pounds.	Carbo-hydrates—pounds.	Fat—pounds.	Total—pounds.	Protein—pounds.	Carbo-hydrates—pounds.	Fat—pounds.	Total—pounds.	Daily gain in live weight—pounds.
Period 1. 91 days. September 1 to November 30, 1893.										
More protein in ration	Steer 1....	.81	5.15	.25	6.21	.53	3.46	.18	4.17	1.16
	Steer 2....	.98	6.61	.30	7.90	.63	4.45	.22	5.30	1.16
Less protein in ration	Steer 3....	.75	5.92	.25	6.93	.45	4.08	.18	4.72	.83
	Steer 4....	.73	5.82	.25	6.80	.44	4.00	.18	4.62	.73
Period 2. 84 days. December 1 to February 22, 1894.										
More protein in ration	Steer 1....	1.30	6.84	.36	8.59	.87	4.50	.27	5.64	1.43
	Steer 2...	1.36	7.55	.40	9.31	.91	4.91	.30	6.11	1.33
Less protein in ration	Steer 3....	.93	7.22	.34	8.49	.55	4.95	.24	5.74	1.10
	Steer 4. ..	.93	7.22	.34	8.49	.55	4.95	.24	5.74	.99
Period 3. 98 days. February 23 to May 31, 1894.										
More protein in ration	Steer 1....	1.71	7.65	.40	9.76	1.19	5.35	.31	6.85	1.87
	Steer 2....	1.81	8.59	.43	10.81	1.25	5.91	.33	7.49	1.90
Less protein in ration	Steer 3....	1.23	8.37	.38	9.98	.77	6.20	.30	7.27	1.71
	Steer 4....	1.23	8.37	.38	9.98	.77	6.20	.30	7.27	1.63
Period 4. 98 days. June 1 to September 6, 1894.										
More protein in ration	Steer 1...	1.77	9.66	.45	11.88	1.21	6.06	.30	7.57	1.31
	Steer 2 ..	1.84	10.40	.48	12.72	1.24	6.50	.32	8.06	1.13
Less protein in ration	Steer 3....	1.20	10.30	.43	11.93	.71	6.78	.28	7.77	1.31
	Steer 4....	1.20	10.30	.43	11.93	.71	6.78	.28	7.77	1.00
Period 5. 91 days. September 7 to December 6, 1894.										
More protein in ration	Steer 1....	2.18	10.59	.53	13.30	1.53	6.76	.37	8.66	1.62
	Steer 2 ...	2.24	11.33	.56	14.13	1.57	7.19	.39	9.14	1.10
Less protein in ration	Steer 3....	1.38	11.31	.55	13.24	.85	7.62	.38	8.85	1.25
	Steer 4....	1.38	11.31	.55	13.24	.85	7.62	.38	8.85	1.00

In order to clearly present the facts relative to the comparative effects of the two rations upon the growth of the steers, as shown by the preceding figures, it is desirable to first review briefly the history of the experiment.

Two pairs of steers were fed, one pair receiving a ration with a nutritive ratio of about 1:5.2 and the other pair, a ration with a much wider nutritive ratio, or one of about 1:9.7. When the experiment had progressed for about seventeen months, one steer from each pair was taken out and slaughtered, and the other two steers were fed for ten months longer. The rations were weighed daily and the steers weekly, and the silage and grains were analyzed, so that it is possible to consider the relations of food growth during the entire experiment or any part of it.

If we consult the foregoing figures we see very clearly that the two rations were quite unlike in their effect during the early stages of the experiment, the nitrogenous ration producing much the larger amount of growth.

As the steers became older and the rations increased in quantity, the difference in the rates of growth produced by the two rations was somewhat less marked, until, at the age of seventeen months, the growth of the two pairs was not greatly unlike.

TABLE XXXV.

	Weight pair fed more protein—pounds.	Weight pair fed less protein—pounds.	Greater weight of protein fed pair—pounds.	Increase of difference in weight.
At beginning of experiment	566	603	—37	
At end of three months	778	746	+32	69
At end of six months	1,010	921	+89	57
At end of nine months	1,379	1,249	+130	41
At end of twelve months	1,618	1,475	+143	13
At end of fifteen months	1,861	1,677	+184	41
At end of seventeen months	1,981	1,807	+174	—10

Not only do the above figures plainly indicate the superiority for the young animals of the ration richer in protein, but the same fact was made very evident by the general condition of the steers. Steers 1 and 2 had an appearance of greater thrift than steers 3 and 4 which was unmistakable.

The superiority of the protein rich over the protein-poor ration during the first year of growth is shown emphatically, also, by the difference in digestible dry matter required in the two cases to produce a pound of growth.

TABLE XXXVI.

DIGESTIBLE MATTER REQUIRED TO PRODUCE ONE POUND OF GROWTH.

	Steers fed more protein.	Steers fed less protein.
During first three months	4.06	5.96
During second three months	4.26	5.53
During third three months	3.83	4.35
During fourth three months	6.45	6.87
During fifth three months	6.97	8.08
Average	5.11	6.16

After two animals were slaughtered at the end of seventeen months, the later results with the other two animals at greater age were not the same. These latter steers were fed ten months longer than the others and during that time the steer eating the ration richer in protein gained 284 pounds and the steer receiving the larger proportion of carbohydrate food gained 377 pounds, a difference in favor of the latter of 93 pounds.

Nothing can be clearer, than that with the particular animals fed, the superiority of the protein-rich ration over the other diminished as the steers increased in age. In seeking for an explanation of this fact we may not go far amiss if we consider that the amount of digestible matter in an animal's food must reach a certain absolute quantity before any can be spared for the formation of new tissues. If the nutritive ratio is wide the small ration of the very young animal supplies so little protein that the quantity is inadequate to meet the demands of the possible active growth of that period of life. When, however, the ration is increased to the capacity of the older and larger animal the absolute quantity of protein fed, even in a wide-ratio ration, is sufficient for a generous growth of tissue. It should be remembered that an animal's capacity for growth does not increase proportionately with the age and weight, or so rapidly as does the capacity for food consumption, consequently with an unvarying nutritive ratio the protein supply is likely to be more nearly adequate with the two-year-old steer than with the yearling. It has been the opinon of the writer for some time that the standard rations known as German rations are entirely consistent with facts in at least two particulars:

1st. They call for a diminishing proportion of protein in the ration of growing animals as the animals proceed toward maturity.

2nd. They call for a larger proportion of protein in the ration of the milch cow than in that of the somewhat mature steer.

We believe that the experiment under discussion gives evidence that tends to substantiate this opinion.

THE INFLUENCE OF THE RATIONS UPON THE COMPOSITION OF THE BODIES OF THE STEERS.

When this experiment was planned it was determined to undertake the somewhat arduous task of making a chemical analysis of the entire bodies of the experimental steers, the purpose of this costly piece of work being to determine whether the composition of their bodies was materially modified by the proportions of nutrients in the food. This plan was carried out and the organs and carcasses of the four animals were analyzed, the only part omitted being the skin and hair. These are believed to be the only fairly complete analyses of the bodies of mature bovines since those made by Lawes & Gilbert nearly forty years ago, whose results were published in 1858.

Separation of parts, sampling and analyses. When the steers were killed the blood was caught in a tub which was set under a small trap door in the floor. The animals were then dressed and the various organs and parts were weighed as soon as removed, the carcasses being also weighed in the green condition.

The various organs and divisions of the body were taken to the laboratory and sampled for analysis as rapidly as the work could be performed. It was not over forty-eight hours after the animals were killed before the samples of all the various parts were secured and in the process of drying.

The manner of obtaining the samples was as follows: In the case of the organs such as the heart, liver, lungs, &c., they were minced very fine by being run through a power Enterprise Meat Chopper. This minced material was thoroughly mixed and then large samples were selected for drying. The flesh of the right side of each carcass was entirely removed from the bones, the muscular tissues and the adipose tissues being separated mechanically as fully as possible and thrown into separate dishes. Both the lean portions and the fat were entirely passed through the meat chopper, large samples being selected from each portion for drying. The lean meat samples were dried and the samples of fat were bottled without drying in air tight jars and kept very cold until analysis. The intestinal and kidney fats were treated in the same way as the body fat.

The samples were brought to an air-dry condition in a drying closet heated by a coil of steam pipe, the temperature of which varied from 50 to 60 degrees C., or 120 to 140 degrees F.

The air-dry samples were finally prepared for analysis by passing them through a mill. The samples of fat which were enclosed in jars without previous drying were submitted to analysis in the fresh condition, the amount of water in adipose tissue being so small as to allow this. For the determination of the fat in these latter materials by extraction with either, unusually large portions were used, approximately 20 grams, and several single determinations were made from such samples. In fact this precaution was taken in every case where the sample contained so much fat as to render the sampling less perfect than was desirable. The percentages of protein given are those obtained "by difference."

Having then the weights of the various organs and parts of the animals and knowing from analysis their percentage composition, it became possible to calculate the proportions of water, ash, protein and fats in the entire animals as well as in the several divisions of the body.

In the tables which immediately follow are displayed very fully the facts which appear from these mechanical and chemical analyses.

Table XXXVII. Weights of the various organs and parts of the steers' bodies.

Table XXXVIII. Composition of the organs and parts of the steers' bodies in the fresh condition.

Table XXXIX to XLII. Composition of the water-free substance of the organs and parts of the steers' bodies with the calculated weights of ash, protein and fat in the same.

Table XLIII. Composition of the entire bodies of the steers, exclusive of skin and contents of stomach and intestines.

Tables XLIV to XLVII. Composition of the carcasses of the steers.

Tables XLVIII to LI. Composition of the edible portion of the carcasses of the steers.

Table LII. Summary of Tables XLIV to XLVII.

Table LIII. Summary of Tables XLVIII to LI.

Table LIV. Proportions of edible materials in the carcasses of the steers.

Table LV. Summary Table LIV.

Table LVI. Proportions of non-edible material in the entire bodies of steers.

Table LVII. Composition of increased growth of older steers.

TABLE XXXVII.

WEIGHTS OF THE VARIOUS PARTS OF STEERS, IN FRESH CONDITION.

	PROTEIN—RICH RATION.		PROTEIN—POOR RATION.	
	Steer 1—pounds.	Steer 2—pounds.	Steer 3—pounds.	Steer 4—pounds.
Live weight	958.0	1,300.0	1,280.0	870.0
External refuse:				
Skin	73.6	96.0	92.5	64.7
Head	29.9	32.5	34.0	26.5
Feet	18.5	22.9	20.6	15.6
Internal refuse:				
Stomach	25.8	35.7	26.5	26.7
Contents of stomach	126.4	160.8	178.5	91.4
Small intestine	15.4	10.1	9.6	12.6
Large intestine	......	9.1	7.0	
Contents of small intestine	23.2	12.9	15.4	26.5
Contents of large intestine	....	17.7	28.7	
Intestinal fat	22.3	40.4	34.5	19.9
Organs:				
Tongue	3.7	4.5	4.5	2.9
Lungs and trachea	6.4	8.9	13.0	7.0
Heart and attachments	6.9	11.7	5.6	5.1
Liver	10.3	12.5	10.7	9.3
Kidneys	1.8	2.5	2.0	1.9
Kidney fat	15.3	22.8	21.4	15.1
Pancreas	1.1	.9	.9	1.1
Spleen	1.4	1.9	2.0	1.5
Bladder, etc	.4	1.3	1.2	.5
Diaphragm	2.6	3.9	4.6	2.9
Gall bladder and contents	.9	.6	.4	.6
Blood	34.3	49.8	46.3	38.3
Fore quarter, right side	127.6	173.5	175.0	123.2
Hind quarter, right side	146.9	195.0	195.0	131.4
Fore quarter, left side	278.7	165.0	162.5	259.2
Hind quarter, left side	....	207.0	200.0	
Whole carcass	553.2	740.5	732.5	513.8

TABLE XXXVIII.

COMPOSITION OF THE ORGANS AND PARTS OF THE STEERS' BODIES, IN THE FRESH CONDITION.

EXTERNAL REFUSE.		Water—per cent.	Water-free substance—per cent.	Protein—per cent.	Fat—per cent.	Ash—per cent.
Lean meat of head	Steer 1	67.04	32.96	18.26	13.79	.91
	Steer 2	68.38	31.62	17.83	12.76	1.03
	Steer 3	69.30	30.7	18.31	11.43	.96
	Steer 4	80.27	19.73	11.73	7.40	.60
Fat of head	Steer 1	20.40	79.60	14.61	64.50	.49
	Steer 2	8.40	91.60	27.34	63.68	.58
	Steer 3	10.90	89.10	19.70	68.38	1.02
	Steer 4	31.80	68.20	10.67	57.04	.49
Bones of head	Steer 1	18.91	81.09	35.25	13.33	32.51
	Steer 2	25.10	74.90	23.87	19.22	31.81
	Steer 3	24.70	75.30	26.34	18.59	30.37
	Steer 4	16.10	83.90	30.01	16.37	37.52
Feet	Steer 1	32.23	67.77	35.71	11.24	20.82
	Steer 2	32.60	67.40	35.55	9.29	22.56
	Steer 3	37.40	62.60	29.99	11.41	21.20
	Steer 4	31.30	68.70	33.53	14.38	20.79
INTERNAL REFUSE.						
Stomachs	Steer 1	75.68	24.32	13.91	9.49	.91
	Steer 2	72.62	27.38	14.62	11.09	1.67
	Steer 3	73.80	26.20	12.65	12.00	1.55
	Steer 4	74.55	25.45	13.40	10.84	1.21
Large intestines	Steer 2	72.69	27.31	9.01	16.89	1.41
	Steer 3	68.97	31.03	11.76	18.38	.89
Small intestines	Steer 2	44.00	56.00	16.25	37.91	1.79
	Steer 3	82.66	17.34	6.64	10.08	.62
Large and small intestines	Steer 1	78.70	21.30	8.03	12.53	.74
	Steer 4	74.37	25.63	11.43	13.02	1.18
Intestinal fat	Steer 1	9.60	90.40	3.29	86.90	.21
	Steer 2	6.40	93.60	2.19	91.28	.13
	Steer 3	5.90	94.10	4.32	89.68	.10
	Steer 4	10.40	89.60	3.68	85.74	.18
Blood	Steer 1	81.83	18.17	17.26	.10	.81
	Steer 2	82.70	17.30	16.46	.08	.76
	Steer 3	80.62	19.38	18.55	.11	.72
	Steer 4	82.38	17.62	16.82	.10	.70
Bladder	Steer 1	61.00	39.00	28.03	9.77	1.20
	Steer 2	65.29	34.71	18.02	15.86	.83
	Steer 3	62.52	37.48	16.26	20.49	.73
	Steer 4	74.22	25.78	19.80	5.11	.87
Diaphragm	Steer 1	61.50	38.50	18.18	19.52	.80
	Steer 2	47.20	52.80	17.43	34.56	.81
	Steer 3	52.94	47.06	16.87	29.60	.59
	Steer 4	53.36	46.64	17.10	28.81	.73
Thorax fat	Steer 1	22.67	77.33	6.84	70.10	.39
	Steer 4	18.90	81.10	7.98	72.81	.31
Heart attachments	Steer 1	40.70	59.30	9.57	49.23	.50

TABLE XXXVIII—CONCLUDED.

COMPOSITION OF THE ORGANS AND PARTS OF THE STEERS' BODIES, IN THE FRESH CONDITION.

Organs.		Water—per cent.	Water-free substance—per cent.	Protein—per cent.	Fat—per cent.	Ash—per cent.
Tongue	Steer 1	68.94	31.06	16.90	13.27	.89
	Steer 2	61.63	38.37	15.40	22.22	.75
	Steer 3	64.03	35.97	15.17	19.91	.89
	Steer 4	65.80	34.20	16.68	16.57	.95
Liver	Steer 1	71.28	28.72	23.18	4.00	1.54
	Steer 2	69.37	30.63	23.93	4.99	1.71
	Steer 3	72.01	27.99	22.55	3.94	1.50
	Steer 4	70.24	29.76	23.86	4.17	1.73
Heart	Steer 1	69.11	30.89	15.17	14.70	1.02
	Steer 2	52.58	47.42	13.76	33.05	.61
	Steer 3	56.26	43.74	18.53	24.37	.84
	Steer 4	60.05	39.95	12.37	26.89	.69
Lungs and trachea	Steer 1	78.15	21.85	17.10	3.65	1.10
	Steer 2	52.65	47.35	33.23	11.55	2.57
	Steer 3	66.21	33.79	15.87	17.01	.91
	Steer 4	77.06	22.94	15.80	5.74	1.40
Kidneys	Steer 1	75.02	24.98	15.44	8.27	1.27
	Steer 2	75.83	24.17	14.95	8.13	1.09
	Steer 3	78.26	21.74	14.70	5.83	1.21
	Steer 4	76.97	23.03	15.52	6.36	1.15
Pancreas	Steer 1	64.58	35.42	16.26	17.69	1.47
	Steer 2	67.76	32.24	16.35	13.82	2.07
	Steer 3	68.63	31.37	14.79	14.91	1.67
	Steer 4	67.83	32.17	16.06	14.60	1.50
Spleen	Steer 1	76.12	23.88	17.38	5.03	1.47
	Steer 2	76.78	23.22	17.56	4.08	1.58
	Steer 3	75.63	24.37	16.29	6.80	1.28
	Steer 4	76.41	23.59	18.48	3.61	1.50

TABLE XXXIX.

COMPOSITION OF WATER-FREE SUBSTANCE OF PARTS OF STEERS' BODIES, WITH WEIGHTS OF ASH, PROTEIN AND FAT.

STEER 1.

	Water-free substance—pounds.	Composition of Water-Free Substance.			Weights of		
		Protein—per cent.	Fat—per cent.	Ash—per cent.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean meat of head, exclusive of tongue,	3.6	55.4	41.8	2.8	1.99	1.51	.10
Fat of head	.9	18.3	81.1	.6	.16	.73	.01
Bones of head	8.7	43.5	16.4	40.1	3.79	1.42	3.49
Feet	9.3	52.7	16.6	30.7	4.90	1.54	2.86
Stomachs	6.3	57.2	39.1	3.7	3.60	2.47	.23
Small intestine } Large intestine }	3.3	37.7	58.8	3.5	1.24	1.94	.12
Intestinal fat	19.6	3.7	96.1	.2	.73	18.83	.04
Diaphragm	1.0	47.2	50.7	2.1	.47	.51	.02
Bladder	.2	71.9	25.0	3.1	.14	.05	.01
Tongue	1.1	54.4	42.7	2.9	.60	.47	.03
Liver	3.0	80.7	13.9	5.4	2.42	.42	.16
Heart and attachments	6.5	18.5	80.3	1.2	1.20	5.22	.08
Lungs and trachea	1.4	78.2	16.7	5.1	1.09	.24	.07
Kidneys	.2	61.8	33.1	5.1	.14	.07	.01
Kidney fat	7.4	1.6	98.3	.1	.11	7.28	.01
Pancreas	.4	45.9	50.0	4.1	.18	.20	.02
Spleen	.3	72.7	21.1	6.2	.22	.06	.02
Blood	6.2	95.0	.6	4.4	5.89	.04	.27
Bones of carcass	26.7	43.5	16.4	40.1	11.61	4.38	10.71
Lean meat of fore quarter, right side	26.2	64.7	32.2	3.1	16.94	8.44	.82
Fat of fore quarter, right side	10.8	8.9	90.7	.4	.96	9.80	.04
Lean meat of hind quart'r, right side	26.7	69.8	26.9	3.3	18.64	7.18	.88
Fat of hind quarter, right side	14.5	5.0	94.7	.3	.73	13.73	.04
*Left side of carcass	114.2	43.7	45.2	11.1	49.91	51.62	12.67
	298.5				127.65	138.15	32.71

* Assumed to have the same composition as the right side.

TABLE XL.

COMPOSITION OF WATER-FREE SUBSTANCE OF STEERS' BODIES, WITH WEIGHTS OF ASH, PROTEIN AND FAT.

STEER 2.

	Water-free substance—pounds.	Composition of Water-Free Substance.			Weights of		
		Protein—per cent.	Fat—per cent.	Ash—per cent.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean meat of head, exclusive of tongue	3.6	56.3	40.4	3.3	2.03	1.45	.12
Fat of head	2.3	29.9	69.5	.6	.69	1.60	.01
Bones of head	12.2	31.9	25.6	42.5	3.89	3.13	5.18
Feet	15.1	52.7	13.8	33.5	7.96	2.08	5.06
Stomachs	9.4	53.4	40.5	6.1	5.02	3.81	.57
Small intestine	5.4	29.0	67.8	3.2	1.57	3.66	.17
Large intestine	2.4	33.0	61.8	5.2	.79	1.48	.12
Intestinal fat	37.3	2.4	97.5	.1	.90	36.37	.04
Diaphragm	2.0	33.0	65.5	1.5	.66	1.31	.03
Bladder	.4	51.9	45.7	2.4	.21	.18	.01
Tongue	1.7	40.1	57.9	2.0	.66	.95	.03
Liver	3.8	78.1	16.3	5.6	2.97	.62	.21
Heart and attachments	3.6	29.0	69.7	1.3	1.04	2.51	.05
Lungs and trachea	4.2	70.2	24.4	5.4	2.95	1.02	.23
Kidneys	.3	61.9	33.6	4.5	.19	.10	.01
Kidney fat	11.1	2.5	97.4	.1	.28	10.81	.01
Pancreas	2.9	50.7	42.9	6.4	1.47	1.24	.19
Spleen	.4	75.6	17.6	6.8	.33	.08	.03
Blood	8.6	95.1	.4	4.4	8.18	.04	.38
Bones of carcass	40.4	31.9	25.6	42.5	12.89	10.34	17.17
Lean meat of fore quarter, right side	34.1	58.1	38.8	3.0	19.85	13.23	1.02
Fat of fore quarter, right side	23.1	10.6	89.0	.4	2.45	20.56	.09
Lean meat of hind quarter, right side	33.8	65.9	30.8	3.3	22.28	10.41	1.12
Fat of hind quarter, right side	34.4	12.9	86.8	.3	4.44	29.86	.10
Left side of carcass	182.5	35.2	53.8	11.0	64.24	98.19	20.07
	475.0				167.94	255.03	52.02

TABLE XLI.

COMPOSITION OF WATER-FREE SUBSTANCE OF STEERS' BODIES, WITH WEIGHTS OF ASH, PROTEIN AND FAT.

STEER 3.

	Water-free substance—pounds.	Composition of Water-Free Substance.			Weights of		
		Protein—per cent.	Fat—per cent.	Ash—per cent.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean meat of head, exclusive of tongue,	3.2	59.7	37.2	3.1	1.91	1.19	.10
Fat of head	3.0	22.1	76.7	1.2	.66	2.30	.00
Bones of head	11.9	35.0	24.7	40.3	4.16	2.94	4.80
Feet	12.9	47.9	18.2	33.9	6.18	2.35	4.37
Stomachs	6.8	48.3	45.8	5.9	3.28	3.11	.40
Small intestine	1.6	38.3	58.1	3.6	.61	.93	.06
Large intestine	2.1	37.9	59.2	2.9	.79	1.24	.06
Intestinal fat	31.5	4.6	95.3	.1	1.45	30.01	.04
Diaphragm	2.1	35.8	62.9	1.3	.75	1.32	.03
Bladder	.4	43.4	54.7	1.9	.17	.22	.01
Tongue	1.6	42.2	55.3	2.5	.67	.89	.04
Liver	3.0	80.6	14.0	5.4	2.42	.42	.16
Heart and attachments	2.9	42.4	55.7	1.9	1.23	1.62	.06
Lungs and trachea	4.2	47.0	50.3	2.7	1.97	2.12	.11
Kidneys	.2	67.6	26.8	5.6	.13	.05	.01
Kidney fat	10.4	2.4	97.5	.1	.25	10.15	.01
Pancreas	.3	47.2	47.5	5.3	.14	.14	.02
Spleen	.5	66.8	27.9	5.3	.33	.14	.02
Blood	9.0	95.7	.6	3.7	8.61	.05	.33
Bones of carcass	44.0	35.0	24.7	40.3	15.39	10.86	17.75
Lean meat of fore quarter, right side	32.6	65.0	31.9	3.1	21.20	10.39	1.01
Fat of fore quarter, right side	25.1	10.0	89.6	.4	2.50	22.50	.10
Lean meat of hind quarter, right side	31.9	69.0	27.6	3.4	22.03	8.80	1.07
Fat of hind quarter, right side	32.8	5.4	94.3	.3	1.78	30.92	.10
Left side of carcass	175.6	35.75	52.92	11.35	62.77	92.93	19.90
	449.6				161.38	237.60	50.56

TABLE XLII.

COMPOSITION OF WATER-FREE SUBSTANCE OF STEERS' BODIES, WITH WEIGHTS OF ASH, PROTEIN AND FAT.

STEER 4.

	Water-free substance—pounds.	Composition of Water-Free Substance.			Weights of		
		Protein—per cent.	Fat—per cent.	Ash—per cent.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean meat of head, exclusive of tongue,	1.9	59.4	37.5	3.1	1.13	.71	.06
Fat of head	1.5	15.7	83.6	.7	.23	1.26	.01
Bones of head	8.9	44.7	35.8	19.5	3.98	3.19	1.73
Feet	12.5	48.8	20.9	30.3	6.10	2.62	3.78
Stomachs	6.3	52.6	42.6	4.8	3.32	2.68	.30
Small intestine } Large intestine }	3.2	44.6	50.8	4.6	1.43	1.62	.15
Intestinal fat	17.9	4.1	95.7	.2	.73	17.13	.04
Diaphragm	1.4	36.7	61.7	1.6	.51	.87	.02
Bladder	.1	76.8	19.8	3.4	.08	.02	.00
Tongue	1.0	48.8	48.4	2.8	.49	.48	.03
Liver	2.8	80.2	14.0	5.8	2.25	.39	.16
Heart and attachments	3.5	14.3	85.1	.6	.50	2.98	.02
Lungs and trachea	1.6	68.9	25.0	6.1	1.10	.40	.10
Kidneys	.2	67.4	27.6	5.0	.13	.06	.01
Kidney fat	7.2	2.6	97.3	.1	.18	7.01	.01
Pancreas	.3	49.9	45.4	4.7	.15	.14	.01
Spleen	.4	78.3	15.3	6.4	.31	.06	.03
Blood	6.8	95.5	.6	3.9	6.49	.04	.27
Bones of carcass	28.1	35.8	19.5	44.7	10.06	5.48	12.54
Lean meat of fore quarter, right side	24.5	64.9	31.9	3.2	15.91	7.81	.78
Fat of fore quarter, right side	11.8	3.9	95.8	.3	.46	11.30	.04
Lean meat of hind quarter, right side	26.9	65.1	31.7	3.2	17.51	8.53	.86
Fat of hind quarter, right side	12.6	8.7	91.0	.3	1.10	11.46	.03
Left side of carcass	113.3	40.77	46.39	12.84	46.20	52.55	14.55
	294.7				120.35	138.79	35.53

TABLE XLIII.

PERCENTAGE COMPOSITION OF ENTIRE BODIES OF STEERS, EXCLUSIVE OF SKIN AND CONTENTS OF STOMACHS AND INTESTINES.

	In Fresh Condition.				In Water-free Substance.		
	Water—per cent.	Protein—per cent.	Fat—per cent.	Ash—per cent.	Protein—per cent.	Fat—per cent.	Ash—per cent.
Steer 1. Protein-rich ration .	59.37	17.38	18.80	4.45	42.78	46.28	10.94
Steer 2. Protein-rich ration .	53.09	16.59	25.18	5.14	35.37	53.68	10.95
Steer 3. Protein-poor ration.	53.41	16.73	24.62	5.24	35.91	52.84	11.25
Steer 4. Protein-poor ration.	57.13	17.51	20.19	5.17	40.85	47.10	12.05

TABLE XLIV.

COMPOSITION OF RIGHT SIDE OF CARCASS.

STEER 1.

	Weights.		Weights of Constituents.			
	Fresh—pounds.	Water-free—pounds.	Water—pounds.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean of fore quarter	87.81	26.15	61.66	16.92	8.42	.81
Fat of fore quarter	13.24	10.80	2.44	.96	9.80	.04
Lean of hind quarter	94.06	26.70	67.36	18.64	7.18	.88
Fat of hind quarter....................	17.03	14.50	2.53	.73	13.73	.04
Kidney	.91	.23	.68	.14	.07	.02
Kidney fat	7.57	7.40	.17	.11	7.28	.01
Bones of carcass	32.90	26.70	6.20	11.61	4.38	10.71
Whole side.........	253.52	112.48	141.04	49.11	50.86	12.51
Percentage composition.............	....	....	% 59.02	% 17.89	% 18.53	% 4.56
Percentage composition water-free.	....	....	....	43.66	45.23	11.11

TABLE XLV.

COMPOSITION OF RIGHT SIDE OF CARCASS.

STEER 2.

	Weights.		Weights of Constituents.			
	Fresh—pounds.	Water-free pounds.	Water—pounds.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean of fore quarter	109.9	34.1	75.80	19.85	13.23	1.02
Fat of fore quarter	30.3	23.1	7.20	2.45	20.56	.09
Lean of hind quarter	114.9	33.8	81.10	22.28	10.41	1.12
Fat of hind quarter	40.9	34.4	6.50	4.44	29.86	.10
Kidney	1.3	.3	1.00	.19	.10	.01
Kidney fat	11.4	11.1	.30	.28	10.81	.01
Bones of carcass	53.9	40.4	13.50	12.89	10.34	17.17
Whole side	362.6	177.2	185.40	62.38	95.31	19.52
Percentage composition	......	......	% 51.91	% 16.93	% 25.86	% 5.30
Percentage composition water-free	......	......	......	35.20	53.78	11.02

TABLE XLVI.

COMPOSITION OF RIGHT SIDE OF CARCASS.

STEER 3.

	Weights.		Weights of Constituents.			
	Fresh—pounds.	Water-free—pounds.	Water—pounds.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean of fore quarter	107.7	32.6	75.10	21.20	10.39	1.01
Fat of fore quarter	31.7	25.1	6.60	2.50	22.49	.10
Lean of hind quarter	110.0	31.9	78.10	22.04	8.80	1.07
Fat of hind quarter	39.5	32.8	6.70	1.78	30.92	.10
Kidney	1.0	.2	.80	.13	.05	.01
Kidney fat	10.7	10.4	.30	.25	10.15	.01
Bones of carcass	58.4	44.0	14.40	15 39	10.86	17.75
Whole side	359.0	177.0	182.00	63.29	93.66	20.05
Percentage composition	......	......	% 52.16	% 17.10	% 25.32	% 5.42
Percentage composition water-free	......	......	......	35.75	52.90	11.35

XLVII.

COMPOSITION OF RIGHT SIDE OF CARCASS.

STEER 4.

	Weights.		Weights of Constituents.			
	Fresh—pounds.	Water-free—pounds.	Water—pounds.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean of fore quarter	80.80	24.50	56.30	15.91	7.81	.78
Fat of fore quarter	14.37	11.80	2.57	.46	11.30	.04
Lean of hind quarter	85.42	26.90	58.52	17.51	8.53	.86
Fat of hind quarter	14.27	12.60	1.67	1.10	11.46	.03
Kidneys	.95	.20	.75	.13	.06	.01
Kidney fat	7.49	7.20	.29	.18	6.97	.01
Bones of carcass	33.46	28.10	5.36	10.05	5.48	12.54
Whole side	236.76	111.30	125.46	45.34	51.61	14.27
Percentage composition	....	....	% 56.30	% 17.82	% 20.27	% 5.61
Percentage composition water-free	....	....	....	40.77	46.39	12.84

TABLE XLVIII.

COMPOSITION OF THE EDIBLE PORTION OF THE CARCASS.

STEER 1.

	Weights.		Weights of Constituents.			
	Fresh—pounds.	Water-free—pounds.	Water—pounds.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean of fore quarter	87.8	26.15	61.65	16.92	8.42	.81
Fat of fore quarter	13.3	10.80	2.50	.96	9.80	.04
	101.1	36.95	64.15	17.88	18.22	.85
Percentage composition fore quarter	....	....	% 63.46	% 17.69	% 18.01	% .84
Percentage composition water-free .	....	......	....	48.41	49.28	2.31
Lean of hind quarter.....................	94.1	26.7	lbs. 67.4	lbs. 18.64	lbs. 7.18	lbs. .88
Fat of hind quarter	17.0	14.5	2.5	.73	13.73	.04
	111.1	41.2	69.9	19.37	20.91	.92
Percentage composition hind quart'r	....	....	% 62.91	% 17.44	% 18.82	% .83
Percentage composition water-free .	....	....	....	47.02	50.75	2.23
Fore quarter.	101.1	36.95	lbs. 64.15	lbs. 17.88	lbs. 18.22	lbs. .85
Hind quarter	111.1	41.20	69.90	19.37	20.91	.92
	212.2	78.15	134.05	37.25	39.13	1.77
Percentage composition of side	.... ..	....	% 63.18	% 17.56	% 18.44	% .82
Percentage composition water-free.	....	....	... ...	47.66	50.07	2.27

TABLE XLIX:

COMPOSITION OF THE EDIBLE PORTION OF THE CARCASS.

STEER 2.

	WEIGHTS.		WEIGHTS OF CONSTITUENTS.			
	Fresh—pounds.	Water-free—pounds.	Water—pounds.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean of fore quarter	109.9	34.1	75.80	19.85	13.25	1.02
Fat of fore quarter	30.3	23.1	7.20	2.45	20.56	.09
	140.2	57.2	23.00	22.30	33.79	1.11
Percentage composition fore quarter	....	....	% 59.20	% 15.90	% 24.10	% .79
Percentage composition water-free	....	....	....	38.99	59.07	1.94
Lean of hind quarter	114.9	33.8	lbs. 81.10	lbs. 22.28	lbs. 10.41	lbs. 1.12
Fat of hind quarter	40.9	34.4	6.50	4.44	29.86	.10
	155.8	68.2	87.60	26.72	40.27	1.22
Percentage composition hind quart'r	....	....	% 56.24	% 17.15	% 25.85	% .76
Percentage composition water-free	....	... .	....	39.18	59.04	1.78
Fore quarter	140.2	57.2	lbs. 83.00	lbs. 22.30	lbs. 33.79	lbs. 1.11
Hind quarter	155.8	68.2	87.60	26.72	40.27	1.22
	296.0	125.4	170.60	49.02	74.06	2.33
Percentage composition of side	....	....	% 57.63	% 16.56	% 25.03	% .78
Percentage composition water-free	....	.. ....	....	39.09	59.05	1.86

TABLE L.

COMPOSITION OF THE EDIBLE PORTION OF THE CARCASS.

STEER 3.

	Weights.		Weights of Constituents.			
	Fresh—pounds.	Water-free pounds.	Water—pounds.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean of fore quarter	107.7	32.6	75.10	21.20	10.39	1.01
Fat of fore quarter	31.7	25.1	6.60	2.50	22.49	.10
	139.4	57.7	81.70	23.70	32.88	1.11
			%	%	%	%
Percentage composition fore quarter	....	....	58.61	17.00	23.59	.80
Percentage composition water-free	....	....	....	41.08	56.99	1.92
			lbs.	lbs.	lbs.	lbs.
Lean of hind quarter	110.0	31.9	78.10	22.04	8.80	1.07
Fat of hind quarter	39.5	32.8	6.70	1.78	30.92	.10
	149.5	64.7	84.80	23.82	39.72	1.17
			%	%	%	%
Percentage composition hind quart'r	....	....	56.71	15.94	26.57	.78
Percentage composition water-free	....	....	....	36.82	61.38	1.80
Fore quarter	139.4	57.7	81.70	23.70	32.88	1.11
Hind quarter	149.5	64.7	84.80	23.82	39.72	1.17
	288.9	122.4	166.50	47.52	72.60	2.28
			%	%	%	%
Percentage composition of side	....	....	57.63	16.45	25.13	.79
Percentage composition water-free	....	....	....	38.83	59.31	1.86

TABLE LI.

COMPOSITION OF THE EDIBLE PORTION OF THE CARCASS.

STEER 4.

	Weights.		Weights of Constituents.			
	Fresh—pounds.	Water-free—pounds.	Water—pounds.	Protein—pounds.	Fat—pounds.	Ash—pounds.
Lean of fore quarter	80.8	24.5	56.30	15.91	7.81	.78
Fat of fore quarter	14.4	11.8	2.60	.46	11.30	.04
	95.2	36.3	58.90	16.37	19.11	.82
			%	%	%	%
Percentage composition fore quarter	....	... .	61.87	17.20	20.07	.86
Percentage composition water-free.	....	....	....	45.10	52.64	2.26
			lbs.	lbs.	lbs.	lbs.
Lean of hind quarter	85.4	26.9	58.50	17.51	8.53	.86
Fat of hind quarter	14.3	12.6	1.70	1.10	11.46	.03
	99.7	39.5	60.20	18.61	19.99	.89
			%	%	%	%
Percentage composition hind quart'r	....	....	60.38	18.67	20.06	.89
Percentage composition water-free.	....	....	....	47.12	50.63	2.25
			lbs.	lbs.	lbs.	lbs.
Fore quarter	95.2	36.3	58.90	16.37	19.11	.82
Hind quarter	99.7	39.5	60.20	18.61	19.99	.89
	194.9	75.8	119.10	34.98	39.10	1.71
			%	%	%	%
Percentage composition of side	....	....	61.12	17.94	20.06	.88
Percentage composition water-free.	....	....	....	46.15	51.59	2.26

TABLE LII.

PERCENTAGE COMPOSITION OF TOTAL DRESSED CARCASS.

		In Fresh Substance.				In Water-Free Substance.		
		Water—per cent.	Protein—per cent.	Fat—per cent.	Ash—per cent.	Protein—per cent.	Fat—per cent.	Ash—per cent.
Protein rich food	Steer 1, fed 17 months..	59.02	17.89	18.53	4.56	43.66	45.23	11.11
	Steer 2, fed 27 months..	51.91	16.93	25 86	5.30	35.20	53.78	11.02
Protein poor food	Steer 3, fed 27 months..	52.16	17.10	25.32	5.42	35.75	52.90	11.35
	Steer 4, fed 17 months..	56.30	17.82	20.27	5.61	40.77	46.39	12.84

TABLE LIII.

COMPOSITION OF EDIBLE PORTION OF DRESSED CARCASSES, EXCLUSIVE OF KIDNEY FAT.

	In Fresh Substance.				In Water-Free Substance.		
	Water—per cent.	Protein—per cent.	Fat—per cent.	Ash—per cent.	Protein—per cent.	Fat—per cent.	Ash—per cent.
Fore quarter, steer 1	63.46	17.69	18.01	.84	48.41	49.28	2.31
2	59.21	15.90	24.10	.79	38.99	59.07	1.94
3	58.01	17.25	23.93	.81	41.08	56.99	1.93
4	61.87	17.20	20.07	.86	45.10	52.64	2.26
Hind quarter, steer 1	62.91	17.44	18.82	.83	47.02	50.75	2.23
2	56.24	17.15	25.85	.76	39.18	59.04	1.78
3	56.71	15.94	26.57	.78	36.82	61.38	1.80
4	60.38	18.67	20.06	.89	47.12	50.63	2.25
Total side, steer 1	63.18	17.56	18.44	.82	47.66	50.07	2.27
2	57.63	16.56	25.03	.78	39.09	59.05	1.86
3	57.34	16.56	25.30	.80	38.83	59.31	1.86
4	61.12	17.94	20.06	.88	46.15	51.59	2 26

TABLE LIV.

PROPORTIONS OF EDIBLE NUTRIENTS IN THE CARCASS.

	Refuse—%.	Edible portion—%.	Edible Portion.		Nutrients.		
			Water—%.	Water-free—%.	Protein—%.	Fat—%.	Ash—%.
Steer 1.							
Total fore quarter	18.30	81.70	52.74	28.96	14.02	14.27	.67
Total hind quarter	13.07	86.93	53.85	33.08	13.26	19.19	.63
Total hind quarter without kidney fat	13.78	82.22	54.01	28.21	13.26	14.32	.63
Whole side	15.52	84.43	53.31	31.17	13.61	16.91	.65
Whole side without kidney fat	15.97	84.03	54.75	29.28	13.95	14.66	.67
Steer 2.							
Total fore quarter	16.83	83.17	50.20	32.97	12.85	19.48	.64
Total hind quarter	13.54	86.46	45.79	40.67	13.84	26.20	.63
Total hind quarter without kidney fat	14.38	85.62	46.06	39.56	15.50	23.36	.70
Whole side	15.09	84.91	47.87	37.04	13.37	23.04	.63
Whole side without kidney fat	15.57	84.43	49.31	35.12	13.73	20.74	.65
Steer 3.							
Total fore quarter	18.51	81.49	48.52	32.97	13.55	18.79	.63
Total hind quarter	13.90	86.10	47.60	38.50	12.34	25.56	.60
Total hind quarter without kidney fat	14.70	85.30	50.20	35.10	12.92	21.55	.63
Whole side	16.08	83.92	48.03	35.89	12.91	22.36	.62
Whole side without kidney fat	16.56	83.44	49.38	34.06	13.22	20.20	.64
Steer 4.							
Total fore quarter	17.54	82.46	52.99	29.47	13.29	15.51	.67
Total hind quarter	14.57	85.43	49.88	35.55	14.31	20.55	.69
Total hind quarter without kidney fat	15.46	84.54	52.65	31.89	15.02	16.15	.72
Whole side	16.00	84.00	51.39	32.61	13.82	18.11	.68
Whole side without kidney fat	16.49	83.51	52.83	30.68	14.16	15.83	.69

TABLE LV.

PROPORTIONS OF EDIBLE MATERIAL IN THE DRESSED CARCASSES OF THE FOUR STEERS.

	Total water-free edible material—per cent.	NUTRIENTS, PROPORTIONS OF EDIBLE.		
		Protein—per cent.	Fat—per cent.	Ash—per cent.
Whole side, without kidney fat, steer 1	29.28	13.95	14.66	.67
2	35.12	13.73	20.74	.65
3	34.06	13.22	20.20	.64
4	30.68	14.16	15.83	.69

The most important consideration in the experiment which we are now discussing is the relative influence of widely different rations upon the development and composition of the bodies of the experimental animals. We have seen that one pair of steers was fed a much larger amount of protein, both absolutely and relatively to the other food constituents, than the other pair.

Of the two steers killed at the end of seventeen months, Steer 1 ate 619 pounds of digestible protein and 3029 pounds of digestible carbohydrates and fats, while Steer 4 ate 370 pounds of digestible protein and 3418 pounds of digestible carbohydrates and fats.

In the case of the two steers killed at the end of twenty-seven months Steer 2 ate 1265 pounds of digestible protein and 6174 pounds of digestible carbohydrates and fats, and Steer 3 ate 700 pounds of digestible protein and 6422 pounds of digestible carbohydrates and fats. In other words, one pair of steers ate nearly eighty per cent. more protein than the other pair. Did this difference in the nutrition of the animals cause material variations in the general development of their bodies, in the proportionate weights of their parts or in the relative quantities of the four classes of constituents water, ash, protein and fat? We have seen that the protein-rich ration caused a more rapid growth of the steers while they were quite young. Did it cause a different growth?

In endeavoring to answer this question we must be controlled by the facts secured with reference to

(1) The relative weights of the organs and parts of the bodies.
(2) The percentage composition of the different organs and parts.
(3) The percentage composition of the body as a whole.
(4) The percentage composition of the carcass.

(5) The percentage composition of the edible portions of the carcass.

(6) The relative amounts of edible material.

It must be borne in mind in this discussion that Steer 1 must be compared with Steer 4, and Steer 2 with Steer 3.

(1) *The relative weights of organs and parts.* Reference to Table shows no marked differences in the relative weights of the different organs and parts.

The proportion of carcass weight, for instance, varies but little in the four animals, as is shown below.

	Steer 1—per cent.	Steer 2—per cent.	Steer 3—per cent.	Steer 4—per cent.
Carcass in per cent of live weight	57.7	57.0	57.2	59.0
Proportion of carcass in body minus the skin and contents of the stomach and intestines.	75.2	73.1	75.9	74.8

A glance at the weights of the different organs reveals no evidence that the larger protein supply caused a more vigorous development of any one of them, neither does it appear that the greater carbohydrate supply increased the quantities of intestinal or kidney fats.

(2) *Composition of the fresh organs and parts.* The figures of Tables XXXVIII to XLII show that the composition of the various organs and parts of the four steers' bodies was somewhat variable, but there are no differences in this respect which can logically be attributed to the food. The great variation in the water content in the heart is accounted for in part by the greater or less amounts of fat and other attachments which were ground up with that organ. In the case of the lungs there appears to be no reasonable explanation of the greatly different percentage composition. The figures hint at an error, but a careful examination of the original data does not reveal any.

(3) *Percentage composition of the entire bodies, exclusive of skin and contents of stomach and intestines.* In Tables XXXIX to XLII are calculated the total quantities of protein, fat and ash in the bodies of the several animals, the skin and contents of stomachs and intestines being ignored. Having these figures and knowing the weights of all the parts in the fresh condition, it is possible to compute the percentage composition of the bodies of the animals as they existed before being killed. This has been done and the results appear in Table XLIII. There certainly is a striking similarity in the composition of the bodies of the steers of the same age. It is very noticeable that the older steers contain a less proportion of water and protein and a larger proportion of fat, but when we compare Steer 1 with Steer 4, and Steer 2 with 3, the differences are not important, and

we fail to discover any indication that the unlike rations have caused unlike growth of tissues.

(4) *Percentage composition of the carcasses (dressed beef.)* The carcasses have the same similarity of composition that the entire bodies do. Comparing the dressed beef from the steers of the same age we find essentially the same proportions of water, ash, protein and fat.

We observe here as in the case of the entire bodies that the older and more mature and fatter animals furnish beef with a smaller proportion of water and protein and a larger proportion of fat than the younger animals do.

(5) *Composition of the edible portion of the carcasses.* This includes in these cases all of the carcass but the bones. Some other material is not edible, such as certain connective tissues (tendons, cartilage &c.) and which would find its way into the kitchen refuse. The bones were all the non-edible portion, however, which it was easy to separate, and the proportion of edible material is not greatly too large. We still fail to find that the unlike rations have caused essential variations in the proportion of water or of any class of constituents in the flesh of the animals. As noted with the dressed beef, the edible parts of the carcasses of the older and maturer steers contain smaller proportions of water and protein and larger proportions of fat than is the case with the younger animals. This fact, though not new, endorses the popular belief that "young" beef does not "spend" as well as that from maturer animals.

The writer is obliged to confess that he is surprised at the outcome of the investigation under discussion. He had expected that the ration with a liberal supply of protein would cause a more generous development and proportion of muscular tissue than the other ration generally regarded as somewhat deficient in protein, and that the latter ration would produce animals relatively richer in fat. This expectation is not realized. While the protein-rich ration did for a time cause more growth than the other, we are unable to discover that it was different growth.

The flesh of the animals which ate the ration relatively poor in protein did not differ in general appearance from that of the other animals, and a chemical analysis does not show any essential difference in the proportions of protein and fats.

This investigation adds materially to the facts previously known which go to show that the individual animal possesses a constitutional inertia which may not easily be overcome. It is, perhaps, only when we resort to extreme measures, that we are able to disturb the methods of growth to which the animal by breeding is committed. It appears that though the ration varies widely, an animal selects from it and assimilates, such materials as suit the needs and purposes of that particular organism, and that while the rate of production may be very much modified by the character of the ration, the kind of production, whether of meat or of milk, is chiefly controlled by the constitutional habit, unless as before stated the conditions of nutrition are rendered very abnormal.

These remarks are not offered as a new or final conclusion, but rather as indicating a general law which the feeder must, and already practically does, recognize.

It is interesting, at least, to note two other points concerning which the preceding data give definite information.

These points are:

(1) The proportion of the actual growth of the animal which may ordinarily serve as human food and therefore is most valuable.

It is easy to ascertain this proportion in the case of these four steers, and this is given in the table which follows:

TABLE LVI.

PROPORTIONS OF NON-EDIBLE MATERIAL IN ENTIRE BODIES OF STEERS.

	Dry Matter.	Protein.	Fat.	Ash.
STEER 1.				
In entire body, exclusive of skin, pounds	298.5	127.6	138.2	32.7
In edible portion, including kidney fat, pounds	171.1	74.7	92.8	3.6
In non-edible portion, pounds	127.4	52.9	45.4	29.1
Per cent in non-edible portion	42.7	41.5	32.8	89.0
STEER 2.				
In entire body, exclusive of skin, pounds	475.0	167.9	255.0	52.02
Edible portion, including kidney fat, pounds	273.0	98.6	169.7	4.7
In non-edible portion, pounds	202.0	69.3	85.3	47.3
Per cent in non-edible portion	42.5	41.3	33.4	90.9
STEER 3.				
In entire body, exclusive of skin, pounds	449.6	161.4	237.6	50.6
Edible portion, including kidney fat, pounds	265.6	95.5	165.5	4.6
In non-edible portion, pounds	184.0	65.9	72.1	46.0
Per cent in non-edible portion	40.9	40.8	30.3	90.9
STEER 4.				
In entire body, exclusive of skin, pounds	294.7	120.3	138.8	35.5
Edible portion, including kidney fat, pounds	166.0	70.3	92.2	3.4
In non-edible portion, pounds	128.7	50.0	46.6	32.1
Per cent in non-edible portion	43.7	41.6	33.6	90.4

It seems that without taking into consideration the skin and hair, over forty per cent. of the dry matter of the animal body is rejected as unfit for food, unless we allow for the use that is sometimes made of the heart, liver and portions of the large stomach.

If we include in the refuse (in the sense of use as food) the skin and the ordinary kitchen waste, we find that very nearly half of the dry matter in body of a fat steer is either wholly wasted or is used for less important and valuable purposes than serving as food for man.

This is in strong contrast to milk as an animal food product, none of which is necessarily rejected.

It has been stated that two of the steers were slaughtered and analyzed at the age of about twenty-two months, while the other pair was fed for ten months longer.

It appears from our analyses entirely probable that the four animals were practically alike in composition when of the same age. This being assumed, we are in a position to learn the composition of the growth during the last ten months of feeding of the older pair.

LVII.

COMPOSITION OF INCREASED GROWTH OF OLDER STEERS.

	In Fresh Material.		In Water-free Material.		
	Water.	Dry substance.	Protein.	Fat.	Ash.
Entire bodies, except skin.					
Two steers fed 27 months	1,072.9	924.6	329.3	492.6	102.6
Two steers fed 17 months	829.2	593.2	248.0	276.9	68.2
	243.7	331.4	81.3	215.7	34.4
Per cent composition younger steers	58.2	41.8	41.8	46.7	11.5
Per cent composition increase for next 10 mos.	42.4	57.6	24.5	65.1	10.4

These results accord in a general way with those reached by Lawes & Gilbert. Those investigators found that the increase in fattening an animal contained a much smaller proportion of water and a greatly larger proportion of fat than the entire body.

The increase in the later stages of growth is of very much the same character, two-thirds of this consisting of fat, whereas the bodies of the younger steers were less than half fat.

Summary.

(1) Beginning at the age of four to six months two pairs of steers were fed from seventeen to twenty-seven months on rations differing widely in their nutritive ratio, one ration having a ratio of 1:5.2

and the other, 1:9.7. One pair ate 1884 pounds of digestible protein in the same time the other pair ate 1070 pounds.

(2) One steer of each pair was slaughtered and analyzed at the end of seventeen months feeding, the remaining steers being fed for ten months longer, when they were killed and analyzed. The chemical analysis included the entire bodies, excepting the skin and the contents of the stomach and intestines.

(3) At the end of fifteen months feeding, the pair of steers fed on the ration richer in protein had gained 221 pounds of live weight more than the pair fed the ration less rich in protein. The later growth with two steers showed a difference in favor of the ration less rich in protein.

(4) The relative weights of organs and parts of the body was practically the same with the steers of the same age, independently of the ration.

(5) The kind of growth caused by the two rations, viz: the proportions of water, protein, fat and ash, was not materially different with the steers of the same size.

This is true whether we consider the entire bodies, the dressed carcasses or the edible portions of the carcasses.

With steers fed for the same time, the composition of the entire bodies, the proportion and composition of the carcasses, and the proportions and composition of the edible parts were practically alike.

(6) The older pair of steers, viz: those fed for ten months longer time, contained a smaller proportion of water and a larger proportion of fat than the younger animals.

(7) The older animals furnished five pounds per hundred more of water-free edible material than the younger animals. This is equivalent to a difference of twelve pounds of fresh, edible meat.

HORTICULTURAL DIVISION.

H. P. Gould, Assistant Horticulturist.

The work of this department during the past year has,in a general way, been a continuation of the investigations of previous years. Cultural methods of certain vegetables have received attention, though the dry weather seriously affected all garden vegetables, and on this account no report can be given on many of the experiments planned at the beginning of the season. Especially does this apply to our work with tomatoes and cauliflowers.

The number of varieties of small fruits growing in the station gardens has been considerably increased and new varieties are constantly being added.

I—NOTES ON POTATOES.

Fungiroid as a Preventive of Potato Rot.

Almost every year brings to light new insecticides and fungicides; some of these discoveries are of great value, while many of them are no better and often far inferior to the older and better known materials.

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.

It has been proven many times, beyond a doubt, that "potato rot" or "late blight" can be held in check, if not entirely prevented by the use of Bordeaux mixture. In order to test the efficacy of fungiroid as a means of combating this disease, a plat of potatoes was treated in the following manner: 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 on the fungicides 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 lbs.	Ratio of yield.	Weight of decayed tubers. lbs.	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 seventy-five per cent. that of the rows sprayed with Bordeaux mixture, or an increase of twenty-five per cent. from the use of the Bordeaux; the total yield from the rows treated with fungiroid was eighty-three per cent. that of the rows sprayed with Bordeaux, or an increase of seventeen 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 one per cent. by weight of decayed tubers, while from the unsprayed rows over ten per cent. by weight of the tubers were 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.

Conclusion: Fungiroid may slightly increase the yield of potatoes but seems to be of very little value as a preventive of late blight.

II—NOTES ON SWEET CORN.

Every one who is at all familiar with the catalogue of the average seedsman 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 likely to be 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.	No. 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 Co.	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 Co	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
Livingston's Evergr'n,	A.W. Livingston's Sons,	July 24	Aug. 10	Sept. 15	108	9.0	7.5
Melrose	J. M. Thorburn & Co	July 26	Aug. 7	Sept. 5	98	....	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
XX Sugar	W. H. Maule	July 24	Aug. 7	Sept. 11	104	7.0	5.5
*Acme Evergreen	Iowa Seed Co.	July 29	Aug. 19	....	....	....	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 8-Rowed	A.W. Livingston's Sons,	July 27	Aug. 10	....	...	....	8.0

* Did not reach edible maturity.

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 Sept. 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—seventy-nine 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.

III—NOTES ON 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.

Our usual rate of seeding has been one quart of seed 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 drawf 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 drawf 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 woud 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.

IV—NOTES ON CABBAGES.

The attention given to cabbages during the past season, as heretofore,was confined chiefly to the study of different methods of culture. Several questions regarding the subject, which have previously received little if any attention, have been investigated.

The seed was all sown April 1st in the forcing house, and the plantlets pricked out into seed flats April 27th where they were allowed to remain until May 25th, when they were all set in the field.

The season was exceptionally dry and although the plants did not suffer from lack of moisture sufficiently to cause them to wilt yet they made a less vigorous growth and consequently smaller heads than would have been the case if there had been more rain.

1. Influence of size of seed. It has been thought by some that the amount of leaf surface relative to the size of the head, is influenced by the size of the seed, the supposition being that plants from large seeds run to leaf at the expense of the head, while with plants from small seed the tendency is the opposite.

That we might assertain, if possible, the accuracy of this view, three varieties of seed were chosen, from each variety of which were selected fifty of the largest seeds, also fifty of the smallest. The seeds were all sowed and when the plantlets were ready for the first handling, twenty of the best specimens from each lot were pricked out into seed flats and then treated as already described.

The comparative results are given in Table I.

TABLE I.

INFLUENCE OF SIZE OF SEED.

Variety.	Weight of 50 seeds—grams.	Heaviest head—pounds.	Lightest head—pounds.	Average weight—pounds.	Per cent of heads cracked.	Per cent of heads immature.	Per cent of plants not forming heads.	Ratio.
Harvest Home:								
Large seed........	.339	9.1	2.1	6.1	7.7	15.4	23.1	.94
Small seed........	.180	8.1	2.3	6.5	.0	.0	.0	1.00
Reynolds' Early:								
Large seed..........	.370	9.7	2.6	5.9	11.8	.0	5.9	1.37
Small seed..........	.169	6.9	2.1	4.3	9.1	18.2	27.3	1.00
Ballhead:								
Large seed..........	.319	8.5	3.6	5.9	.0	.0	.0	1.69
Small seed.........	.140	7.1	2.6	3.5	.0	.0	.0	1.00

The first column of figures gives the weight in grams of the various lots of seed. It will be observed that of the first variety, Harvest Home, the large seed weighed somewhat less than double that of the small seed while of the two other varieties, the large seed weighed more than twice as much as the small. The heaviest heads were produced by plants coming from the large seed while one of the smallest head was also produced by the large seed. In the case of the two last varieties referred to in the table, the smallest heads in comparison were from small seed. The figures relating to the maturity of the heads are so contradictory that no conclusions can be drawn regarding that point. The facts presented in the last column are perhaps the most striking and at the same time of the most value. These figures represent the ratio of the average weights of the heads compared. Representing the average weights of the heads from the small seed by 1, we find in case of the first variety that the average weight of the heads from the large seed is represented by .94. In other words, the large seed produced heads which averaged six per cent. less by weight than did those from the small seed. The average weights of the two other varieties,Reynolds Early and Ballhead, were 37 per cent. and 69 per cent. respectively in favor of the heads from large seed.

Deduction. It seems probable that the size of the seed has some influence upon the size of the head, the larger seeds as a rule,producing the larger heads.

2. RESULTS OF TYING UP THE OUTER LEAVES. The idea has been entertained, that by binding the outer leaves together over the head

of the plant, maturity could be hastened. With this object in view, three lots of plants were treated accordingly as soon as the heads had commenced to form and corresponding lots were grown as checks. The results, so far as represented by figures, are tabulated below.

TABLE II.

EFFECT OF BINDING OUTER LEAVES TOGETHER.

VARIETY.	Heaviest head—pounds.	Lightest head—pounds.	Average weight—pounds.	Per cent of heads cracked.	Per cent of heads immature.	Per cent of plants not forming heads.	Ratio.
Harvest Home.							
Outer leaves tied up	6.1	.8	3.0	26.7	.0	33.3	.44
Check	9.8	3.1	6.8	25.0	5.0	.0	1.00
Surehead.							
Outer leaves tied up	4.1	.8	2.6	14.3	.0	35.8	.46
Check	8.1	1.0	5.7	5.3	.0	5.3	1.00
Reynolds Early.							
Outer leaves tied up	4.9	.6	3.1	30.8	.0	53.8	.67
Check	9.9	2.1	4.6	47.1	5.9	17.6	1.00

The figures relative to the point in question reveal nothing from which we can infer that the operation has any influence upon the maturity of the heads.

By examining the table, however, it can readily be seen that the operation was not without its effects.

In next to the last column is found the percentage of plants from each lot which failed to form heads. Of the first variety, every check plant developed a head, while of the treated plants one-third failed to head; of the second variety, nearly the same proportion failed; while of the third variety, over one-half of the treated plants gave similar results, as did also about 17 per cent. of the check plants, making nearly the same difference between the percentage of plants failing to head in each comparison.

Again, the size of the head was greatly decreased by the treatment. The last column gives the relative weights of average heads. In two instances the average weight of the treated plants was less than one-half and in one case but little more than one-half that of the heads from the untreated plants.

Another result of tying up the outer leaves, which was even more noticeable than any yet mentioned, as the plants were growing in the field, was the effect upon quality. The overlapping leaves did not effectually shut out the rain, yet when the moisture had once entered the spaces between the leaves, it was sufficiently inclosed to prevent a rapid evaporation. This continued dampness among the leaves very soon caused the outer portions of the heads to decay. As the season advanced, the decay extended both outward and inward, resulting in a large proportion of the leaves falling off a long time before the growth of the plants would otherwise have ceased. The result was that not a single marketable head was produced by the plants receiving the special treatment. Doubtless the premature falling of the leaves accounts in a measure at least for the decreased size of the heads.

Deduction. Tying up the outer leaves of the cabbage appears to have no influence upon the maturity of the heads, but it results in a marked decrease in the size of the heads and causes them to decay.

3. Effect of mulching: The value of straw or some similar material used as a mulch, in the conservation of soil moisture has often been discussed. Our experience in mulching tomatoes has already been reported.*

In order to ascertain, if possible, the effect of a similar treatment upon cabbages, several plants of three different varieties were given a mulch of swale hay, a sufficient amount being put on so that when packed down it should be two or three inches thick. It was applied after the plants had recovered from the check of being set in the field and growth had fairly begun. Three corresponding lots received frequent cultivation.

Table III is a statement of the results as represented by figures.

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* Report Maine Experiment Station, 1894, p. 64.

TABLE III.

EFFECT OF MULCHING.

Variety and Treatment.	Heaviest head—pounds.	Lightest head—pounds.	Average weight—pounds.	Per cent of heads cracked.	Per cent of heads immature.	per cent of plants not forming heads.	Ratio.
Lupton:							
Mulched	9.5	2.8	6.0	5.3	.0	.0	1.00
Cultivated	8.9	1.5	6.0	31.3	12.5	6 2	1.00
Surehead:							
Mulched	9.1	2.6	6.1	5.9	11.8	.0	1.07
Cultivated	8.1	1.0	5.7	5.3	.0	5.3	1.00
Harvest Home:							
Mulched	11.2	3.6	7.7	21.1	15.8	.0	1.13
Cultivated	9·8	3.1	6.8	25.0	5.0	.0	1.00

The facts expressed in the above table are not at all conclusive. By referring to the figures relative to the maturity of the heads, it will be observed that of the first variety about five per cent of the mulched and thirty-one per cent. of the heads from the cultivated plants were cracked at the time of cutting. As the cracking occurs as a result of over maturity, the comparison last made,would of itself seem to indicate that the difference in results was due to the different treatment, but when studied in connection with other facts it loses its significance. This is shown in the case of the second variety which gave nearly the same percentage of cracked heads in both lots of plants. The difference between the two lots of the third variety was not great—less than three per cent. The sixth column gives the percentages of immature heads at the time of cutting. Of the first variety, all of the heads from the mulched plants were fully mature while about twelve per cent. of the cultivated were immature; in the second case, the conditions are just reversed; in the third case, the difference was nearly the same as in the former, but five per cent. of the heads from the cultivated plants were immature. Comparing the observations in the three instances, we find the greater number of immature heads were obtained from the mulched plants, while all of the plants which failed to head were from the cultivated lots.

The most uniform difference between the results of the two methods of culture was in the size of the heads. This difference was not striking, however, and may have been the result of other causes, though the conditions were as nearly uniform as possible aside from the special treatment given. The average weights of the Lupton from both lots was the same; while of the Surehead and Harvest Home, the average weights were seven per cent. and thirteen per cent. respective greater from the mulched plants.

Deduction: Indications point to an advantageous use of a mulch in growing cabbages especially in a dry season.

4. SHALLOW CULTIVATION VS. DEEP CULTIVATION: The value of thorough cultivation has in recent years been greatly emphasized, though not unduly so, but as to just what is implied by thorough cultivation there may be a difference of opinion.

It has been our practice touse the cultivator withmuch freedom in the cultivation of nearly all garden vegetables and where the plants are set out carefully in straight rows the cultivator is usually run as close to the plants as possible without disturbing them. This becomes in many cases a method of root pruning. In order tc determine, if possible, whether this method of cultivation has any specific effect upon the results obtained, twenty plants from each of four varieties were given the cultivation described above while four similar lots were given only such cultivation as could be furnished with a common hoe, though with the same frequency as the plants receiving deep cultivation.

The results are given in table IV.

TABLE IV.

SHALLOW VS. DEEP CULTIVATION.

VARIETY AND TREATMENT.	Heaviest head—pounds.	Lightest head—pounds.	Average weight—pounds.	Per cent of heads cracked.	Per cent of heads immature.	Per cent of plants not forming heads.	Ratio.
Harvest Home.							
Shallow cultivation	6.4	0.9	4.9	.0	52.6	5.3	.72
Deep cultivation	9.8	3.1	6.8	25.0	5.0	.0	1.00
Lupton.							
Shallow cultivation	7.9	1.6	5.6	15.8	5.3	5.3	.93
Deep cultivation	8.9	1.5	6.0	31.2	12.5	6.2	1.00
One-hundred Weight.							
Shallow cultivation	8.1	1.3	5.4	5.6	11.1	.0	1.12
Deep cultivation	6.8	3.2	4.8	.0	.0	16.7	1.00
Surehead.							
Shallow cultivation	10.0	3.0	6.6	5.3	10.5	.0	1.16
Deep cultivation	8.1	1.0	5.7	5.3	.0	5.3	1.00

Referring to the figures relating to the maturity of the different lots, it will be observed that of the first two varieties, the percentage of the cracked heads from the plants receiving deep cultivation was noticeably large, giving evidence of a greater maturity of the deeply cultivated plants; on the other hand the evidence of the third variety is contradictory and of the fourth, neutral. The difference in the percentages of immature heads gives evidence of the same fact; in three instances the proportion of immature heads was greater from the plants given shallow cultivation.

The effect of the different methods of culture did not seem to manifest itself in the size of the heads, as in two cases the results favor deep cultivation, while in the other two the larger heads were produced by the plants receiving shallow cultivation.

Deduction: Deep cultivation appears to hasten the maturity of the plants as evinced by the greater percentage of cracked heads from the deeply cultivated plants and by the greater percentage of immature heads from the plants given shallow cultivation. The size of the heads does not appear to be influenced by the different methods of culture.

VARIETIES.

Harvest Home: (Northrup, Braslan, Goodwin Co.) This is a late variety of good size, heads fairly solid, nearly spherical in shape.

Ballhead: (*Improved Danish Ballhead Winter*, James Vick's Sons). A rather small variety, shape nearly spherical, very hard and solid. Medium early.

Reynolds' Early: (Gregory). A medium early variety of good size, moderately firm and vigorous. Said to be the result of an artificial cross between the Scheweinfurt Quintal and Cannon Ball cabbage. This is a desirable variety for its season.

Lupton: (Maule). A sport form Excelsior Flat Dutch found in the fall of 1888. It forms a large, solid, flat head; plant strong and vigorous with a short stem. A very satisfactory variety for late use.

The other varieties mentioned above are satisfactory sorts but have no distinctive characteristics and require no special mention.

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 appears to have no influence upon the maturity of the head, 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 appear to mature earlier and more uniformly than plants receiving shallow cultivation.

REPORT OF BOTANIST AND ENTOMOLOGIST.

Prof. F. L. Harvey.

Professor W. H. Jordan:

Dear Sir:—I have the honor to submit herewith my eighth annual report as botanist and entomologist for the experiment station.

The work of the season has been along the usual lines, embracing field work upon injurious plants and insects,laboratory investigations upon the life histories of insects and plants, preparation of material to illustrate lectures upon insects and weeds, lectures, preparation of articles for the press, correspondence and preparation of this annual report.

The most important field and laboratory work was upon the life history of *Trypeta* (*Epochra*) *Canadensis* (*Loew*) a fly doing much damage by stinging currants. This consumed considerable time during the summer months and the results of the study are given in the body of the report.

Boxes for storing specimens showing stages in the life history of a single insect, or small group of insects, have been made and the work of collecting and preparing specimens is in progress. These will be useful for comparison in study and determination of species and to illustrate talks upon insects before winter course students and farmers meetings.

A complete collection of weeds and forage plants is in process of preparation and will be useful for naming specimens sent for determination and to illustrate lectures.

Besides the local lectures to winter students in agriculture upon injurious insects and fungi, several appointments to lecture have been filled in various parts of the State; two for the Pomological Society at Presque Isle, two for the Board of Agriculture at West Rockport and Washington in Knox county, three at North Berwick, Saco and Cornish in York county; one at Turner Centre in Androscoggin county and one at North Jay, Franklin county, and two for granges at Fryeburg Centre and Monmouth. The subjects treated were Native Cranberries,Orchard and Farm Insects,Fungi and Weeds. At most points two subjects were considered.

An article upon Cattle Lice was written for the Lewiston Journal besides articles for other State papers, and also several papers of a technical nature upon the plants and animals of Maine were contributed to natural history journals.

As you are to sever your connection with the Maine Experiment Station at the close of the year I wish to thank you for the interest you have always taken in my work and for the liberal provision which has always been made to aid me in my investigatons and to express my regret thet such pleasant personal relations cannot continue.

DIRECTIONS FOR SENDING SPECIMENS

will be found in the annual report of the Experiment Station, 1888, page 194 or in the Maine Agricultural Report 1888, page 158.

CORRESPONDENCE.

It is the duty of the Station Botanist and Entomologist to answer questions regarding plants and insects that are of economic importance. Any citizen of Maine may avail himself of this privilege. Correspondence is therefore invited. We would particularly like to have farmers send us specimens of weeds they find in their fields as we wish to study the distribution of weeds in the State.

Below will be found notes upon the plants, and insects of importance that have claimed attention during the year. Those requiring detailed consideration are treated in the body of the Report. The usual tables of record of plants and insects are given below.

NOTES ON PLANTS.

BERTEROA INCANA, a cruciferous weed mentioned in our last report seems to have established itself, as specimens were received again this season. The various species of the mustard family are abundant in Maine.

THE DICHOTOMOUS CATCHFLY, which was received from so many sources last year was not reported this season. Being an annual and such a coarse conspicuous plant the farmers probably cut it before seeding, and will have no further trouble with it.

THE COMMON ST. JOHN'S WORT, was received from South Rumford. This species is common in Maine, and is a pernicious weed. A perennial with a tough root. It is common in pastures, roadsides and thickets.

THE WILD CARROT was found to be quite abundant in Knox county where it has become well established along neglected roadsides.

THE COMMON EVENING PRIMROSE is quite abundant in various parts of Maine. It was considered in Board of Agricultural Crop Bulletin for August, 1895. Its large yellow flowers built on the plan of four and its size make it a conspicuous weed. It is not so common as the sundrops mentioned in our last report.

THE YELLOW BED STRAW was received for the first time the past season. It occurs as a weed in fields in Carroll.

THE CANADIAN GOLDEN-ROD is a common coarse species very abundant in fence corners and about pastures and thickets. It is usually associated with two or three golden-rods, asters and compositae.

THE CONE FLOWER OR YELLOW DAISY as it is called in Maine is distributed throughout the State. It was introduced with grass and clover seed from the West.

THE SCABROUS HAWKWEED a native species was received from several parties. It is related to the Orange Hawkweed, but is not nearly so bad a weed. The native species is found in open woods, thickets and grass lands. It has yellow blossoms and a leafy stem. The Orange Hawkweed has dark orange flowers.

THE GIANT LAURAL (*Rhododendron Maximum, L.,*) was received from Mr. C. S. Phinney of Standish. This is a rare species and the letter regarding it printed in the body of the report will be interesting.

THE CLOVER DODDER reported last season, seems to be abundant having been received this season from Kennebec, Penobscot and Piscataquis counties.

THE CREEPING THYME was reported for the first time. It is a weed belonging to the mint family.

THE ENGLISH PLANTAIN is still being shipped into the State in clover seed. It was found in two samples of seed examined the past season.

THE BLACK BINDWEED, a common twining plant belonging to the same family as the smartweeds, docks, sorrels and buckwheat, was received from Piscataquis county. It is a plant introduced from Europe, and the seed abundant in western oats.

BASTARD TOAD FLAX was reported from Sanford. It is not common in Maine. We have not seen it in Eastern Maine.

There has been no great damage done by fungi in the State the past season. The APPLE SCAB was more or less prevalent as usual. Not a single letter was received about other fungi. The dryness of the season would no doubt account for it.

NOTES ON INSECTS.

THE LONG-NOSED OX LOUSE was reported as very abundant on cattle in the vicinity of Thomaston, and from specimens sent by Mr. A. W. Batchelder, we were able to describe and figure the egg of this species which was not known before. This species is rare, the species found on cattle being more commonly the short-nosed louse, or sometimes the biting louse of cattle. An article upon cattle lice written for the *Lewiston Journal* is found in the body of the report.

THE WOOLLY-LOUSE OF THE APPLE was reported as feeding upon raspberries.

THE CHINCH BUG was found last August in a pasture in Moose River township about a mile from Jackman. The location was a sandy hillside. Quite large sports were infested. This species has been reported from Bethel about twenty-five miles north of Fryeburg. The new locality is fully 100 miles to the northeast.

THE YELLOW WOOLLY BEAR was reported as feeding upon raspberries. It has not been reported to the station before and therefore will be considered in this report.

THE APPLE-TREE TENT CATERPILLAR was received. This common insect should give no trouble as it is so easy to remove the egg clusters from the branches during the winter when the trees are leafless.

THE CLOTHES MOTH, (*Tinea Pelionella, L.,*) was found eating holes in carpets and shawls at Augusta.

THE MOURNING CLOAK BUTTERFLY did considerable damage to the foliage of elm trees about Waterville the past season.

THE CURRANT FLY, (*Trypeta (Epochra) Canadensis*) is doing considerable damage to currants in Maine. The fly stings the fruit and deposits an egg. The habits are much like those of the apple trypeta. This speces is considered, and illustrated in the body of the report.

Paoria Gilvipes, a small black beetle appearing the last of April or early in May, was reported as doing great damage by eating the buds on raspberry canes. Attention was called to this fact through the public print. In the body of the report the life history is given. This beetle is capable of doing much damage and has been a great nuisance to strawberry growers.

THE CUCUMBER FLEA BEETLE was reported as eating holes in petunia leaves. This is a common insect in early gardens feeding upon the leaves of radishes, cucumbers, squashes and potatoes. It is a small black beetle that has the power of jumping. There is a species of spring tail (*Smynthurus*) very common in Maine that has about the same habits as this beetle, and is liable to be mistaken for it. It is about the same size, jumps and eats small holes in the leaves. It should be called a garden flea, and may be distinguished by having long antennae and a forked jumping organ. It has never been described in the books.

THE LARDER OR BACON BEETLE is very abundant in Maine. The disgusting hairy larvae are well known to most house keepers. The insect is considered in the body of the report.

THE PEAR TREE SLUG continues to do some damage to the foliage of plum, pear and cherry trees. This insect was considered and figured in Station Report 1888, page 176.

THE GALL FLY (*Rhodites sp.*) In 1891 we found quite a number of moss like galls upon roses in the garden of Eben Webster, Orono, and reared from them the flies. Some of these were sent to Prof. Riley, who made the following reply:

"Your No. 3, is something of a puzzle. The gall is like that of the ordinary *Rhodites rosae*, but insect differs in the very important respect of totally lacking the parasidal sutures, a character which is at least of specific importance." We do not know whether the species was afterwards considered by Prof. Riley, nor what was done with the specimens. We did not study the insect further, and have not noticed the galls so abundant since. It is interesting to have the same galls reported from another locality, Mattawamkeag, Maine.

The black oak trees in Maine are often infested by a gall fly which produces large knotty excrescences on the branches, which are full of small holes after the insects have emerged. We have examined galls sent by Mr. Stover of Blue Hill, and find the species producing them is called by entomologists, *Callirhytis punctatus*, Bass.

THE HORN-TAILED BORER, a large species of saw fly that makes round holes about the size of a lead pencil in various trees was reported as laying its eggs in a maple tree.

THE APPLE MAGGOT, (*Trypeta Pomonella*) continues to be a great pest. It is spreading. Several parties have reported that by keeping the windfalls picked up or by keeping sheep in the orchard they have held it in check. As long as early apples are imported from Massachusetts, more or less infested with the larvae of this pest, our Maine towns will continue to be centres for the distribution of Trypeta.

THE BUFFALO CARPET BEETLE seems to be spreading, having been reported as very abundant in Saco, South Litchfield and Bangor.

PLANTS EXAMINED IN 1895.

No.	Common Name.	Technical Name.	From Whom Received.	Remarks.
1	....	*Berteroa incana*, D. C	....	Growing in grass lands. Introduced in 1893. Bad cruciferous weed.
2	Dichotomous Catchfly	*Silene dichotoma*, Ehrb.		
3	Long-leaved Chickweed	*Stellaria longifolia*, *Muhl.*	D. W. Lundray, Carroll	Growing in low grassy places.
4	Common St. John's-wort	*Hypericum perforatum*, L	T. H. Thornton, South Rumford	"A pernicious weed difficult to extirpate."
5	Lucerne. Alfalfa	*Medicago sativa*, L	E. P. Mayo, Waterville	Cultivated for fodder but spontaneous in fields. The specimens from Vassalboro.
6	Vetch	*Vicia Cracca*, L	G. G. Glover, Naples	Weed in mowing fields Bridgton. Native species but also found in Europe.
7	Cinquefoil	*Potentilla Norvegica*, L	....	Considered in August Crop Bulletin.
8	Common Evening Primrose	*Œnothera biennis*, L	T. H. Thornton, South Rumford	The plants sent by Mr. Thornton were considered in August Crop Bulletin. A coarse biennial weed with large yellow flowers.
9	Wild Carrot	*Daucus carota*, L	E. E. Light, Union	Very abundant in Knox county about Union and Washington.
10	Yellow Bed Straw	*Galium verum*, L	D. W. Lundray, Carroll	Weed in fields. Introduced from Europe.
11	Canadian Golden-rod	*Solidago Canadensis*, L	T. H. Thornton, South Rumford	Weed along the border of fields and thickets. A native species.
12	Common Fleabane	*Erigeron Philadelphicus*, L.	T. H. Thornton, South Rumford	A common native weed. Perennial. Cultivation needed to eradicate it.
13	Called Yellow Daisy in Maine. Cone Flower. Nigger-head elsewhere	*Rudbeckia hirta*, L	T. H. Thornton, South Rumford E. B. Haynes, Monson	A western species. Introduced in grass and clover seed from the West. Not abundant nor especially dangerous.
14	Scabrous Hawkweed	*Hieracium scabrum*, Mx	Several parties	A native species in open woods and pastures. Has yellow flowers. Not dangerous.

15	GREAT LAUREL	*Rhododendron maximum*, L	C. S. Phinney, Standish	Sent to be named. Rare in Maine. See letter in body of Report.
16	CLOVER DODDER	*Cuscuta Epithymum*, Murr	F. H. Parlin, East Winthrop I. N. Lapham, Pittston E. G. Lovejoy, Medford Center	A parasite upon red clover known by the fine yellow threads and clustered white flowers. Introduced from Europe.
17	CREEPING THYME	*Thymus serpyllum*, L	I. T. Merrill, China	A single bunch found on the farm. Not noticed before.
18	RIBGRASS. ENGLISH PLANTAIN.	*Plantago lanceolata*, L	J. H. Barton, West Windsor H. A. Sprague, Charlotte	Plant growing in fields. In sample of clover seed inspected.
19	WATER SMARTWEED	*Polygonum amphibium*, L	Abner T. Wing, Weld	Growing in bog hole from which muck had been taken.
20	BLACK BINDWEED	*Polygonum Convolvulus*, L	E. G. Lovejoy, Medford Center	Weed in fields.
21	BASTARD TOAD-FLAX	*Comandra Umbellata*, Nutt	O. H. Perkins, Sanford	Weed in field. Not common. Root parasitic on roots of trees.
22	REED CANARY GRASS	*Phalaris arundinacea*, L	D. W. Lundray, Carroll	Weed in fields. Native species which also grows in Europe.

INSECTS EXAMINED IN 1895.

No.	Common Name.	Technical Name.	From Whom Received.	Remarks.
1	Long-nosed Ox Louse	*Hæmatopinus vitula*, L	A. W. Batchelder, Thomaston	Very abundant on cattle.
2	Woolly Louse of the Apple,	*Schizoneura lonigera* (Hausm.)	Dr. A. I. Harvey, Newport	Feeding on raspberry plants. (See Station Report 1890, p. 131.)
3	The Chinch Bug	*Blissus leucopterus*, Say	F. L. Harvey, Orono	Found in pastures near Jackman, Me., in August.
4	The Yellow Woolly Bear	*Spilosoma Virginica* (Fabr.)	M. B. Whiting	Feeding on raspberry leaves.
5	The Apple-tree Tent Caterpillar	*Clissiocampa Americana* (Harris)	E. G. Lovejoy, Medford Center.	Feeding on apple trees.
6	The Appleleaf Bucculatrix,	*Bucculatrix pomifoliella* (Clem.).	L. F. Abbott, Lewiston	Feeding on apple leaves in the vicinity of Wilton. (See Ex. Sta. Report 1893, p. 164.)
7	Clothes Moth	*Tinea tapetzella*, L	Mrs. Andrews, Augusta	Found eating holes in a shawl and carpet.
8	Mourning Cloak Butterfly,	*Euvanessa antiopa*, L	E. P. Mayo, Waterville	Feeding on elms. (See Ex. Sta. Report 1888, p. 187.)
9	The Currant Fly	*Epochra Canadensis* (Loew.)	F. L. Harvey, Orono	Doing much damage to currants in Maine by stinging the fruit.
10	The Spotted Paria	*Paria gilvipes* (Def.)=*Typophorus canellus gilvipes* (Def.)	W. C. Symonds, North Norway; C. L. Bray, Hebron	Attacking the buds on raspberry canes. Appearing the last of April or early in May.
11	The Cucumber Flea-beetle	*Crepidodera cucumeris* (Harris)	W. L. Mower, Greene	Attacking petunia leaves. Common in spring on cucumbers, radishes, potatoes, &c.
12	Larder or Bacon Beetle	*Dermestis lardarius*, L	Mrs. Albert Caswell, New Sharon	Found about rennet, old cheese and in bread closet.
13	The Pear-tree Slug	*Selandria cerasi* (Peck)	C. L. Duncan, Wells; W. L. Mace, East Winthrop	Attacking leaves of plum, pear and cherry trees. (See Station Report 1888, p. 176.)
14	Rose Gall Fly	*Rhodites sp.* (probably new)	Stark Webster, Mattawamkeag,	Producing large mossy galls upon roses.
15	Oak Tree Gall.	*Callirhytis punctatus* (Bass.)	Austin Stover, Bluehill	Producing galls on oak trees.
16	The Horn-tail Borer	*Tremex columba*, L	Geo. P. Billings, Clinton	Depositing eggs in maple trees in which the larva live.

BOTANY.

SECOND BLOOMING OF PEAR TREES.

I have received from Hon. Samuel Libby of Orono, specimens of pear tree twigs in full bloom, taken from a pear tree in the orchard of R. H. Libby of Newport. We have also received recently from Aroostook county specimens of cherry twigs bearing bloom. The following facts regarding unusual and second blooming may be worthy of record.

It is a principle well known to botanists that the last effort of a plant is to reproduce itself. When a tree puts forth unusual bloom, or bloom out of season, it may be reasonably inferred that something is disturbing its normal functions or sapping its vitality. There are several causes, external and internal, that may produce this result.

(a) If a tree puts forth unusual bloom beyond what is normal and the tree shows no other signs of injury, it would be well to look for borers in the trunk or insects that feed on the roots.

(b) Fungi that attack the foliage, or injurious insects that feed upon the leaves may so check the growth of the annual shoots that the effort to reproduce will show itself the same season in late blooming.

This is the case with the pear tree in Mr. Libby's orchard. The blades of the leaves upon the twigs shown us, were almost entirely eaten by some unknown insect, the petioles and midribs only being left. The new shoots and flower buds were formed before the insect began its attack. The leaves were almost entirely eaten, the vitality of the tree checked, and the effort to reproduce caused the tree to put forth full bloom. The insect had done its work and gone into the ground to transform when attention was called to the tree by the late bloom.

Of course a tree suffers from such a shock and the bloom for the following season is destroyed, and without leaves the plant cannot elaborate food for present or future use and is quite liable to die. A few twigs may be affected by insects or fungi and the general vitality not impaired.

(c) Sometimes when growth is checked early in the season by drought and followed by a wet fall, plants take on a second or fall growth. They put forth the flowers in the fall that normally would not develop until the next season. Of course the following season would be a shy bearing year. Fall and spring growth is shown in the trunks of exogenous trees by two narrow rings which together about equal those of ordinary years.

Advantage is taken of the tendency of plants to reproduce when their vitality is checked to bring trees into early blooming. By putting a stone in the crotch, or binding a limb with a cord, or even girdling a twig or trunk the vitality is checked and the tree brought into early bearing.

CATTLE LICE.

During the long Maine winters when snow on the ground prevents animals from finding dry earth to paw over themselves, they are apt to become lousy. Cattle lice breed rapidly. A single infested animal, if neglected, will before spring become literally alive, and by close contact in the stable and yard is almost certain to spread the parasites to the whole herd. These parasites are therefore more apt to give trouble during the winter. We have recently received specimens for examination, accompanied by a request for information as to the nature of the parasites, and how to destroy them. As there seems to be a demand for information we can better serve the many by preparing an article on these pests. The following article is designed to give information regarding lice in general, and to consider more in detail, three species that infest domestic cattle. Those wishing information regarding lice that affect other domestic animals will do well to procure a copy of Bulletin No. 7, Division of Entomology U. S. Department of Agriculture, from which the cuts to illustrate this article were taken.

GENERAL CONSIDERATION.

The term louse is derived from the same root as loss and loose, and is used in the sence of damager or destroyer and applies to quite a variety of degraded crustacean and insect parasites that do more or less damage to their hosts.

All of the lice belong to that branch of the animal kingdom called *Arthropoda* (jointed-footed animals) which embraces the crustaceans and insects. To the crustaceans belong the wood lice or sow bugs, non-parasitic, and feeding upon decaying organic matter and found in damp places. Some of their near relatives are true fish parasites and together with a large number of other degraded crustaceans, parasitic on fish, sea mammals and other crustaceans, are called fish lice. Certain mites (degraded spiders) are often called lice. To this group belong the red lice or harvest ticks, and the well-known itch louse or itch mite and others. These have eight legs.

The remainder of the lice are true insects (*Hexapods*) having six legs and belonging to several orders. Insects themselves are infested with minute lice. Those known as bee lice are degraded flies (*Diptera.*)Bees are also infested by minute lice belonging to the order *Coleoptera* (beetles.)

The bark lice, plant lice, and jumping plant lice are bugs (*Hemiptera.*)They are provided with beaks by means of which they suck the juices of plants. The sucking lice of animals, embracing the head louse and body louse of man and a large number of other species parasitic upon domestic and wild animals, are also bugs and belong to the order *Hemiptera* (half-winged insects.)

The bird lice or biting lice include a large number of species of wingless parasites that infest birds and animals, and belong to the order *Pseudoneuroptera* (false nerve-winged insects.)

With the above general consideration we proceed to consider the lice of domestic cattle, two species of which belong to the sucking lice and a third belonging to the bird or biting lice.

SHORT-NOSED OX-LOUSE.

(*Haematopinus Eurysternus, Nitzsch.*)

ORDER HEMIPTRA; FAMILY PEDICULIDAE.

HISTORY.

This species has been known from the earliest times as a cattle louse though often confused with the next species. It was accurately described for the first time by Nitzsch in 1818. It has always been regarding as troublesome, causing a disease called *Phthiriasis*, demanding treatment.

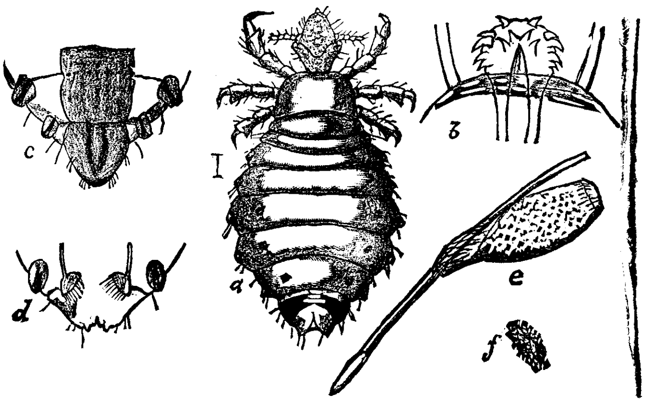


FIG. 1.

DESCRIPTION.

Females about one-eighth to one-half of an inch long and fully haif as wide. Head bluntly rounded in front, nearly as broad as long. Antennae on the middle and side of the head, five jointed. Eyes very small, located upon low eminences just back of the antennae, front of the head provided with an extensible beak, which is armed with a double row of recurved hooks (See Fig. 1 b) by means of which the parasite is attached to the host. Also provided with a slender piercing tube by which blood is drawn from the host. Thorax broader than long, widest next to the abdomen. Legs, long, adapted for clasping. Basal joint of tarsus armed with a double plate bearing fine transverse ridges. Abdomen usually flat and flask-shaped, but variable according to degree of distention. A row of tubercles along each side, in which the spiracles (breathing pores) are located. Along each side of the upper surface a row of chitinous plates. There are two brush-like organs on the under surface of the next to the last abdominal segment, (See Fig. 1 d.) The upper surface of last abdominal segment black.

Males smaller and narrower than the females. There is a broad, black stripe upon the under surface running from the posterior end of the body forward to near the middle of the abdomen. (See Fig. 1 c.) The structure of the last segments of the abdomen of the sexes is quite distinct. (See Figs. 1, c and d.) The general color of both sexes is blue slate, though somewhat variable with sex, age and condition. The head and thorax are brown or yellowish. The tubercles at the sides and the chitinous plates chestnut.

Eggs minute, elongate, oval, tapering toward the base, which is attached by adhesive material to the hairs near the roots. Surface reticulate, the crossings armed with minute points. We do not know the time required to hatch, nor the number of eggs laid. The eggs are generally called *nits*. (See Fig. 1 e.)

The young escape from the upper end of the egg, which is provided with a cap-like lid. They are like the parents only smaller, and as they mature develop the chitinous plates.

LONG-NOSED OX LOUSE.

(*Haematopinus vitula, Linn-tenuirostris*, Burm.)

ORDER HEMIPTERA: FAMILY PEDICULIDAE.

HISTORY.

In connection with the previous species, this louse has long been known to cattle men and entomologists, though often confused with it, as both are often found parasitic upon the same animal. The specimens we have received this winter have all been of this species.

DESCRIPTION.

About one-eighth of an inch long and not more than one-third as wide. (See Fig. 2.) The head oblong, nearly four times as long as wide, and widest in the middle, just behind the antennae, set well back into a groove of the thorax and acute behind. Antennae five-jointed, located on the middle and side and usually extending forward. Thorax nearly twice as long as wide, with a breathing pore on the upper side opposite each of the second pair of legs. Abdomen oblong, wih nine segments. Devoid of chitinous plates or tubercles at the sides. Clothed, apparently, with small teeth, the outer row giving the edge of the body a finely dentate appearance. The terminal segment bilobed behind, each angle armed with about five rather long hairs. The two or three preceding segments bearing, on each side, two quite long hairs. The under side of the next to the last abdominal segment bears two brush-like organs. (See Fig. 2.) General color, bluish gray in adults. The life history of this species is much like that of the preceding species, though the details are no better known.

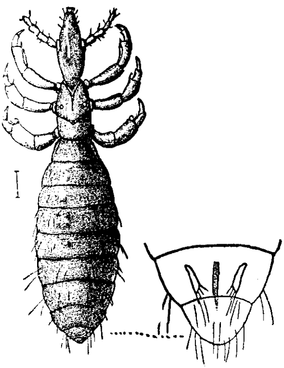


FIG. 2.

BITING LOUSE OF CATTLE.

(*Trichodectes scalaris*, Nitzsch.)

ORDER PSEUDONEUROPTERA: FAMILY PHILOPTERIDAE.

GENERAL CONSIDERATION.

This species of louse belongs to what are usually called bird lice (Mallophagans.) They are provided with mouth parts adapted for biting. They infest birds and animals, feeding upon the hairs, feathers, epidermal scales and waste products of the body of their hosts. They are said to have a suctorial organ and probably at times feed upon the blood. They are wingless, one family (Philopteridae) having the legs adapted for clasping and another family (Liotheidae) adapted for running. The bodies are usually horny and much flattened. The species are so numerous that there is scarcely a bird but what harbors one or more kinds. Some regard them as essential to the health of the host, that is, mutuals. They probably cleanse and beautify the feathers and remove wastes from the body. They injure animals less seriously than the true suctorial lice, as their principal food is wastes of the body. In great numbers, especially upon tender skinned animals, they are a source of much irritation, causing the animals to grow poor and lack vigor.

History and Distribution.

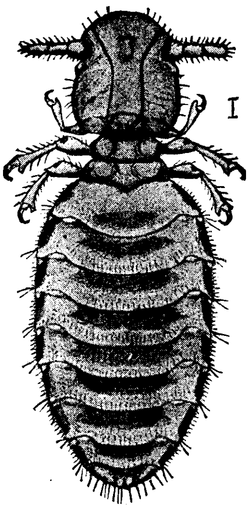


Fig. 3.

Abundant the world over upon cattle. First described by Linnaeus as *Pediculus bovis*. The present name was given it some time later and is adopted regardless of priority. The species is one of the best known animal parasites.

Description.

About one-twelfth of an inch long and of the form shown in Fig. 3. The antennae have only three joints, while the most of the bird lice have five joints to the antennae. There are dark bands across the abdomen as shown in Fig. 3. On account of the size and color they are called "little red lice" to distinguish them from the larger sucking lice that infest cattle and popularly named "blue lice." They are naturally more abundant in the spring. The eggs are attached to the hair and the young resemble in form the adults. Nothing is known regarding the number of eggs laid, the time required for them to hatch, or the time it takes them to mature, or the length of life. Here is an opportunity for some entomologist to distinguish himself, by tracing the life history of this and other species of cattle lice.

Remedies.

Lice irritate the skin. When animals are found rubbing they should be examined at once. If lice are found, separate the infested animals. Search about the neck and shoulders, at the base of the horns, around the eyes and nostrils, and along the back. Separate the hair and expose the skin. If lice are present they can generally be detected. A fine toothed comb could be used in searching. Infested animals are generally restless. When badly infested they lose flesh and the coat is staring. Bare places from rubbing appear on the neck and shoulders. It would be well to examine animals when they are put into winter quarters and not wait for pronounced cases before adopting remedial measures.

The authorized remedies for lice naturally divide themselves into four classes, viz: powders, unctions, liquids and fumes.

The powders usually employed are pyrethrum, ashes or road dust.

The unctions, mercurial ointment, and a mixture of kerosene and lard.

The liquids, decoctions of tobacco, stavesacre, or the seeds of the common larkspur; solution of carbolic acid soap, or kerosene emulsion. The fumes, burning tobacco, sulphur, or phyrethum.

Pyrethrum or Persian Insect Powder should be blown into the hair by means of a small pair of hand bellows until it is well filled. Ashes could be applied in the same way or sifted over the animal and rubbed in with the hand. Dry fine road dust can be used, and like ashes probably acts by stopping the spiracles of the parasite. This last seems to be nature's remedy, as animals will throw dirt over themselves when they have access to it . The unctions should be applied about the eyes, nostrils, base of horns, upon the neck and shoulders, and along the back. The decoctions are not practical remedies during the winter, unless the animals are kept in a warm room during treatment. The liquid remedies are probably the best and should be rsorted to when possible, especially in bad cases. The animals should be wet with the solution. Care should be taken that the solution is not too strong, and keep it out of the animal's eyes. The kerosene emulsion should be considerably diluted. The animals could be carded with a brush dipped in kerosene oil and the lice much reduced or destroyed.

Fumigation of the animals is sometimes resorted to, but it requires a tight box stall with a door behind and a wood stanchion in front. A canvas covering is made to fit tightly over the head of the animal, leaving only the eyes and nose exposed, while the other end of the canvas is tacked to the stall. Into this compartment through an opening, the burning tobacco, sulphur or pyrethrum is introduced. The time of exposure would vary with the strength of the fumes. Prof. Osborn found that the fumes from two ounces of tobacco and a half hour exposure was sufficient. Pyrethrum would probably do equally as well or better. The tobacco or pyrethrum could be burnt upon a piece of sheet iron heated by a small kerosene oil stove. r

EGGS OF THE LONG-NOSED OX-LOUSE.

Haematopinus Vitula, L.

After writing the article upon cattle lice we received from Mr. Batchelder specimens of hair with the eggs of the above species attached. As the egg had never been described and figured, we prepared the following account which appeared in Psyche, June 1895, but it should be put on record in the Station Report.

Professor Osborn says in his monograph "Pedicula and Mallophaga affecting Man and the Lower Animals" (Bull. 7, Div. Ent. U. S. Dept. Agric. p. 18) "that the eggs of this species have not been described, and we have not had the good fortune to discover them." Having been more fortunate we are able to submit the following account of the eggs of this species. The Long-nosed ox-louse has been quite bad this winter in herds in the vicinity of Thomaston, Maine. At our request Mr. A. W. Batchelder of Thomaston collected some hair from the infested animals, and upon this we found *three egg-shells* with the operculum off, but the form, sculpture, manner and place of attachment to the hairs seemed perfect.

Description.

Elongate oval, tapering toward the base. Slightly bulging on the side away from the hair in one specimen, or in the others narrower and more symmetrical. About two and a half times as long as wide. The empty shell hyaline and *beautifully sculptured with hexagonal reticulations.* The hexagons somewhat variable in size and perfectness in different parts of the shell, but average ones about one-twentieth of the width of the shell. The surface apparently smooth, the angles of the reticulations not beset with points as in the eggs of the Short-nosed ox-louse. Attached to the hair by a cement mass about one-third the length of the egg, as shown in the figure. The cement mass varies in shape, the distance it extends along the hair and the remoteness of the attachment from the root of the hair. The sloping base of the eggs is included more or less in the cement mass, and the eggs stands somewhat obliquely outward from the hair.

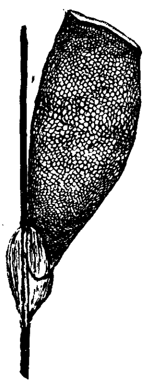


Fig. 4.

Below we give measurements of the three eggs observed. The figure, drawn to scale by the writer, shows the egg enlarged 40 times.

Measurements.

Specimen (*a*,) length, .863 mm.; width, .38 mm.; width of operculum, .265mm.; from base of hair, 5 mm.; cement mass, .345 mm.; hexagonal reticulations of shell, .02 mm.

Specimen (*b*,) length, .805 mm.; width, .379.; width of operculum, .253 mm.; from base of hair, 5.75 mm.; cement mass, .288 mm.

Specimen (*c*,) length, .805 mm.; width, .379 mm.; width of operculum, .265 mm.; from base of hair, 10 mm.; cement mass, .312 mm.

THE YELLOW WOOLLY-BEAR.

Spilosoma Virginica (Fabr.)

Order. Lepidoptera. Family Arctidae.

This insect was reported the past season as feeding on raspberry leaves. Though more commonly found on grapes it feeds upon various plants. The eggs are deposited in clusters on the under side of the leaves.

The young larvae feed in company for a time, but finely separate each going its way.

When full grown the larva is about two inches long and usually yellow, but sometimes straw color or brown. The segments are armed with yellowish tubercles which bear tufts of yellowish or brownish hairs. When ready to transform the hairs are woven with silk into a cocoon. The perfect insect called "The White Miller" appears in April or May. It expands nearly two inches and is pure white with a few black spots.

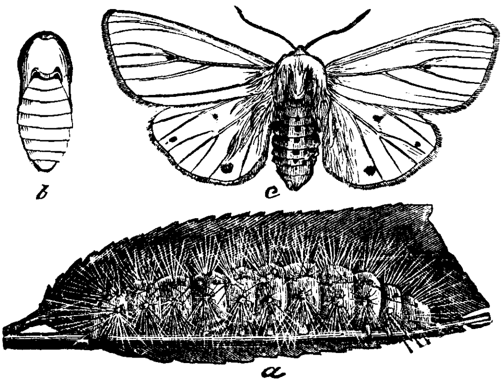


FIG. 5.

REMEDIES.

Hand-picking is the best method to keep them in check. The best time to destroy them is while the young are feeding in company and before much damage to the foliage is done.

THE TAPESTRY MOTH.

Tinea Tapetzella, L.

ORDER LEPIDOPTERA. FAMILY TINEIDAE.

A specimen of the above named cloths moth was received from Mrs. Andrews of Augusta. It was reported as eating holes in a carpet and a shawl. This is the rarest clothes moth found in Maine. Besides the above species that makes channels through cloth in which it works and does not make a case out of the fragment of the cloth, are two others which are quite common, viz: *Tinea pelionella*, L., which make little cases out of the cloth fragments in which it works, and *Tinea biselliella*, which spins a cocoon found under the infected carpet.

The above mentioned species on account of its rarety is not likely to become much of a pest.

THE SPOTTED PARIA. STRAWBERRY LEAF BEETLE.

Typophrus Canellus, Fabr. var. gilvipes, Dej.

ORDER COLEOPTERA. FAMILY CHRYSOMELIDAE.

We received the following letter, No. 1, from Mr. Bray, accompanied by specimens, which we carefully examined and named as above. We wrote him to spray with Paris green at once, and also asked a number of questions stating that this insect had been known as a great pest to strawberry growers in other states, but had not before been reported as injurous to the strawberry or raspberry in Maine. In letters No. 2 and 3 will be found the reply. After reciving Mr. Bray's second letter, to be sure that we were right, specimens were submitted to Dr. Horn and Mr. Henshaw both specialists in Coleoptera, and they confirmed the name. The fact that this insect has done no damage to strawberries in Maine, and should take to raspberries and blackberries is somewhat remarkable. It is also strange that it should appear in noticeable numbers so suddenly. Below is given an account of the insect.

HEBRON, MAINE, April 30, 1895.

Professor Jordan:

DEAR SIR—I send you some raspberry canes and a few of the insects that are eating them. I have one acre of Cuthbert raspberries and they are covered with the insect enclosed. They eat into the buds as shown on the canes sent, and I fear will ruin the crop. I had a few of the same last year. They do not seem to fly around, but crawl up the canes from the ground. I shall try spraying with "Paris green", four ounces to fifty gallons of water, but do not have much faith that it will do any good. I think there will have to be something used on the canes that they will not like the smell of to prevent their crawling up. Please tell me what they are and what remedies I had better try.

Respectfully yours,
C. L. BRAY,
Hebron, Maine.

HEBRON, MAINE, May 14, 1895.

Mr. Harvey:

DEAR SIR—Yours at hand and in reply will say that I fear you have got the wrong insect. I have raised all kinds of small fruits for the past ten years including strawberries and have never noticed the insect before last year, and then only on raspberries. I got my first raspberry plants about ten years ago from A. M. Purdy, Palmyra, N. Y., and have increased my patch to one acre from them. I have sold plants to different parties and fail to hear of any injury being done to any of them with one exception. Last year was the first time I ever saw any of the insects, and where I raised in 1893, 80 bushels of berries I got only 30 in 1894. I sold about 1300 plants last year, but fail to find that the insect was seen on any of them after leaving me either last year or this. I have never seen any grubs in the ground except the large white grub that infests grass and strawberries. They are very numerous and I have about given up raising strawberries on account of them. There is hardly a green leaf on my whole acre, neither are there any sprouts coming up. They seem to be eaten off as soon as they break through the ground. They appeared in large numbers as early as April 15th or 20th, and damaged them so before I noticed them that I got discouraged and have not tried to do much with them. I put on about 30 bushels of wood ashes to the acre, and think that it checked them one-half or more until we had a rain when they seemed to be thicker than ever. They do not jump, but the least touch of the bushes or in walking through them talking or making much noise they will curl up and drop to the ground as though they could see or hear. I noticed they began mating about May first, but at this writing they have about all disappeared. About your questions will say:

First. They began mating about May 1st. I first noticed them about April 15th or 20th.

Second. I have never seen them jump and do not think they do.

Third. I saw them first in the spring of 1894, they were quite plentiful and did much damage.

Fourth. I have grown strawberries, but never saw them infested with this insect.

Fifth. I bought 100 plants from New York ten years ago, and and have increased my patch from them. Have sold a great many plants to different parties, but fail to hear of them being infested on any of them with one exception.

Sixth. I have never noticed any white grubs about the roots. Any further information that I can give you will be cheerfully given, as I want to be prepared to fight them next spring.

Yours truly,
C. L. BRAY,
Hebron, Maine.

Thinking it desirable to find out how widely this pest was distributed in the State, we put the following letter into the Bangor, Lewiston and Augusta papers.

ORONO, Me., May 13, 1895.

We desire to call attention through the columns of the Journal to a small black beetle about one-eighth inch long that is reported as climbing up raspberry canes and eating the opening buds. This is one of the worst pests to the strawberry grower, and should not be neglected.

These beetles hybernate and come out early in the spring doing great damage to the flower buds. They soon mate and lay eggs for a second brood. The grubs live in the roots of the plant and later appear as beetles and in the summer devour the foliage. Those killed now will prevent the increase.

The canes should be sprayed at once with Paris green, one pound to 200 gallons of water, or one pound of fresh white helebore to 50 gallons of water. To ascertain whether this beetle is common in the State and also to learn whether it has been known to feed upon raspberry plants, we would be pleased to hear from any one who has observed it; to make the matter certain, a few of the beetles and a cane with the buds injured should be sent in a wooden box, or, if working on strawberry leaves, the beetles only need be sent.

F. L. HARVEY, Entomologist,
Experiment Station.

In response to the above notice we received the following letter and a package of the above named beetle.

NORTH NORWAY, Me., May 16, 1896.

DEAR SIR—Noticing your communication to the Lewiston Journal in regard to the raspberry flea-beetle, will say, that a small brown jumping beetle, hard to catch, has done considerable damage to my half acre of Shaffer raspberries. Have not seen them on strawberries, but have seen them on blackberries, but they did but little damage. They are especially injurious to raspberries that leave out late. I have collected a few of the insects and mail them. They are not a jumping animal, but fall and play dead on being disturbed.

Yours truly,
W. C. SYMONDS.

Below we give letters received this spring just as we are completing our report and insert them as additional information upon this pest.

HEBRON, Me., May 12, 1896.

Prof. F. L. Harvey:

DEAR SIR—The bugs came on to my raspberries about April 20th, and it has been a fight between us two which would win, but it now looks, as you will see by the canes sent, as though the bugs would conquer. I have never raised but a very few strawberries and have never seen any of the bugs on them. Last year I looked the few vines I had over very carefully, but failed to find any of them. I have sprayed the most of the piece with Paris green, one to fifty gallons water, but can see no difference, and doubt very much if it will do any good as they take the bud before it begins to open and eat the inside all out, so you see it would be a difficult job to get the poison where they would get it. The only way that I can see is by hand killing. I have never seen any of the bugs jump, but they will roll off the bushes as soon as disturbed. I also send you a bug that is longer and lighter colored. (There seems to be two colors of the bug I sent you last year. One a shiny black, and the other a little reddish, perhaps male and female.) I find them quite plenty on the raspberry bushes that have got some leaves. The black bugs eat the sprouts in the ground, as you will see by the root sent.

Very truly,
C. L. BRAY.

NORTH NORWAY, Me., May 5, 1896.

Mr. F. L. Harvey:

DEAR SIR—The beetles referred to have appeared in large numbers. They can be seen flying on warm days near the patch. They attack everything in the shape of raspberries and blackberries, wild or cultivated. They have never yet done the blackberries much harm, seeming to prefer the blackcaps. They do not molest the strawberries close by. I did not spray last season. I have not noticed a second brood.

Yours truly,
W. C. SYMONDS.

HISTORY.

This insect was first reported injurious to strawberries in Canada, as early as 1873. Since then it has done considerable damage to strawberries. The larvae working in the roots and crown of the plant and the beetles eating the foliage. It is a general feeder (polyphagous) being known to feed upon juniper, walnut, hickory, black locust, hypericum, solidago, etc. Prof. Forbes reports it feeding upon raspberry leaves in 1884, but does not say it did serious damage. The cases referred to above would seem to be the first instances of great damage being done to raspberries and so far as we know, injury to the buds early in the season has not been reported. So far as we know it has never before been found feeding on blackberries. It has never been reported to the Station as doing injury to strawberries in Maine. That it should first appear in injurious numbers upon an unusual food plant is strange. The larvae have hitherto only been found in strawberry roots. It will be interesting to learn whether the raspberries were near strawberry patches, and whether the larvae attack the roots of raspberries and blackberries. The following description of the larva and pupa we take from Prof. Forbes' account, as we have not had them for study.

DESCRIPTION.

Larva—"White, 3 to 4 mm.; (.12 to .16 in.) long, and half as wide. The head and first segment pale yellowish brown." We have never seen larvae taken in Maine.

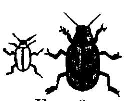


FIG. 6.

Pupa—"White except the eyes and mandibles which show red or black through the pupa skin. The head is bent against the breast and the legs folded against the body beneath."

Perfect Insect a small beetle about one-eighth of an inch long, usually polished black. The wing covers marked with longitudinal rows of pits. The thorax irregularly pitted with smaller depressions than those on the wings. The body stout. The legs brown.

Mr. Saunders says this insect is about three-tenths of an inch long. Out of sixteen specimens measured none exceeded 3.5 mm., and most were only 3 mm. or about one-eighth inch long.

He says: "pale in color—sometimes dark" having the wing covers spotted with black. Out of sixteen we mounted at random all are entirely black on the wing covers excepting one which had brownish elytra bearing *four* black stripes, two on each wing cover as shown in Mr. Saunders figure which we give above. We would think the reverse of Mr. Saunders' statement—usually black, sometimes pale—would be more nearly correct. Prof. Forbes in his Second Report, page 161, says: "In the lighter specimens the ventral segments and *three* spots on each elytron are black. Whether these variations in color are due to age, sex or food we do not know. It is evident that some careful work is still needed upon the habits and transformations of this insect. The eggs so far as we know are not known, nor the place of deposition. It is probable that these beetles hybernote, and the pupa that spring, but spent the winter in the beetle form about the roots of the plant.

Remedies.

Should the beetles crawl up the canes before the buds start or after the leaves unfold and before the fruit is formed spraying with Paris green would prove effectual.

Should they appear after the leaves and fruit are formed, as is usually the case, then it would be unsafe to use Paris green, and hellebore would have to be used.

Mr. Bray's experience would indicate that Paris green is not efficient. Certainly one pound to fifty gallons ought to kill them. A repellant or an insecticide that would injure the insect would have to be applied.

As the beetles probably hybernate it would be well to clean up all rubbish about the canes that would afford them winter shelter.

Hand picking though slow may have to be resorted to to check them.

THE CUCUMBER FLEA-BEETLE.

Crepidodera cucumeris, Harris.

Order Coleoptera. Family Chrysomelidae.

A small black beetle about one-sixteenth of an inch long. The antennae and legs are yellow. The hind pair large and strong and adapted for jumping. Very abundant in Maine, early in the spring upon various garden plants, eating small holes in the leaves. It was reported as feeding upon petunias. The beetles spent the winter under rubbish or stones and are ready to attack the earliest plants. The larvae are said to live on the leaves attacked. There are several broods during the summer. The beetle enlarged is shown in Fig. 7. The short line at the left shows the real size.

Fig. 7.

Remedies.

Sprinkle the leaves with hellebore powder or Paris green mixed with fifty parts of flour or plaster. Air-slaked lime or even ashes are said to be good remedies.

THE CURRANT FLY. GOOSEBERRY FRUIT FLY.

Epochra Canadensis, Loew.

Order Diptera: Family Trypetidae.

Bibliography.

Loew—In Smith. Miss. Colls. 256. Monographs of the Diptera of North America Pt. III, p. 235, December 1873. Original description under the name *Trypeta Canadensis*, n. sp. from a Canadian or Maine specimen. *Epochra* is suggested as the more proper generic name. The female is described, evidently from a single faded imperfect specimen, Habits not stated.

Saunders—Insects injurious to fruits, 1883, p. 352. "This insect is occasionally found attacking the fruit of both the red and the white currant. In its perfect state it is a small two-winged fly, which lays its eggs on the currants while they are small; the larva enters them while still green, and feeds on their contents, leaving a round, black scar at the point of entry. The affected currants ripen prematurely, and shortly decay and drop to the ground, when on opening them, there wil be found in each a small white grub, about one-third of an inch long, which when mature leaves the currant and probably passes the chrysalis state under the ground." The above is a full statement of Saunders' remarks in Insects Injurious to Fruits, p. 352.

Gillette, C. P.—Colorado Experiment Station, Bulletin No. 19, p. 18, May 1892. Account of its attacking gooseberries in Colorado. That the fly punctures the skin by a sharp ovipositor. The eggs were observed under the skin. The flies noticed ovipositing. The berries soon turn red and drop after being stung and the maggots remain in them for some time after they fall to the ground. The flies captured and identified. But one brood. Gathering the fallen infested berries suggested as a remedy.

Editors Insect Life. Injurious Insects of 1891 in Colorado. Review of above Bulletin, No. 19. Mere mention of the Gooseberry Fruit Fly (*Epochra Canadensis*, Loew.)

Snow, W. A.—Kans. Univ. Quar., Vol. 11, No. 3, 1894, p. 159. "One male (Maine) in poor preservation apparently belongs here. The wing agrees with the description; the stature of the body can hardly be called "short and rather broad;" the scutellum has four bristles.

Loew was in doubt whether the normal number of bristles on the scutellum was four or six. The reddish abdomen is black at the base and on the two distal segments, but this coloring has much the appearance of being the result of dessication." The above is a full statement of Prof. Snow's remarks, which we insert because they may not be readily accessible, and because we refer to them under *Critical remarks.*

History and Distribution.

This species was first considered by Loew in 1873, from a single faded female contributed by Osten Sacken. Osten Sacken's material may have come from Maine, as he gives Norway, Maine, as the locality, the specimens having been collected by S. J. Smith. Loew gives Canada as a locality upon the authority of Mr. Provancher. How long the species had been known before it was described does not appear, but Osten Sacken says it "seems to be common in those regions." If its habit of infesting currants was known in 1873, no mention is made of it. It is next considered by Saunders in 1883. During the intervening ten years its currant infesting habit became known and some attempts were made to determine its life history.

In 1891, Prof. Gillette found it very abundant in Colorado, infesting gooseberries. This being the first authentic account of its infesting that fruit. Prof. Gillette also added many facts regarding the life history as given above.

Prof. Snow in 1894 examined a single male and contributes the fact, that the bristles on the scutellum are four.

Regarding the single male specimens considered by Prof. Snow, (See bibliography above) he gives us the following: "My single specimen of *Epochra Canadensis* is from the Yale collection and I found it among Dr. Willeston's flies. There is no label upon it except "Me." and Dr. W. can give me no farther information."

We find no reference to this insect in the Agricultural and Horticultural Reports of Maine, and if it has done injury heretofore it has not been recorded.

Mr. Z. A. Gilbert says he was formerly troubled by such an insect, but stopped growing currants for a time and then resumed and has not been troubled since. Mr. D. H. Knowlton, Farmington, says his currants have been infested for several years.

Our first knowledge of this insect was in the summer of 1894, when Prof. Jordan called attention to the fact that a large number of the currants in his garden in Orono was dropping, and that the fallen fruits each contained one or more white maggots. The only reference found to such a currant insect was the few words regarding *Epochra Canadensis*, Loew, in Saunders Fruit Insects, p. 352.

The serious nature of the injury being a matter of importance, and the fact that the life history was apparently almost entirely unknown led us to seriously begin the study of its habits. We were strengthened in this resolution after finding that the description given by Loew was drawn up from a single female. We did not then know of Prof. Gillett's observations, which are accurate in the main but general, and we trust the more detailed study we have made will be helpful. We were interested in comparing the life history of this insect with *Trypeta pomonella*, Walsh, which we studied in 1888-9. The experience gained in the study of that insect has aided us very much in the study of this. We studied the larvae and pupae in the summer of 1894, and in the spring of 1895 considered the flies, their eggs, and the method of ovipositing, completing the life history. The following results of our study are humbly given hoping they may contribute to a better knowledge of this injurious insect.

The following data which probably refers to *Epochra Canadensis* lacks sufficient confirmation.

Mr. L. O. Howard informs us that in the notes of the Division of Entomology at Washington are the following facts: "June 15, 1885, package of currants and gooseberries infested with larvae evidently of *T. Canadensis* was received from G. L. Colfax, Washington (State.) The adults were not reared. "July 11, 1892, package of gooseberries infested by what is evidently the same insect was received from D. Thurston, West Ferndale, Washington (State.) The larvae were dead when received.

To gain farther information we addressed a letter to Mr. Thurston and received the following reply.

WEST FERNDALE, WHATCOM CO., WASH., July 7, 1895.

Prof. Francis L. Harvey, Orono, Maine.

DEAR SIR—Yours of July 1st to hand. During the years 1890, '91, '92, I noticed my currants (black, white and red,) also gooseberries badly troubled with the worm you refer to. In '93 I was at the World's Fair and could make no observations. In '94 I did not notice any, (my attention not being specially directed to the subject.) This season, '95, at your request I have just looked over my small fruit and failed to find a single specimen! although in the years referred to they were so abundant as in '92 to spoil one-third of the gooseberries and black currants. The only reason I can give for the change, is that for the past few years, I have allowed the young chickens to run at large in the berry patch, and during fall, winter and early spring I allowed the large fowl to run at large also, and they may have exterminated the larvae after they had reached the ground. When I pick the crop if I find any wormy specimens I will forward them.

I remain yours truly,

A. W. THORNTON.

We addressed a letter to Prof. James Fletcher regarding its occurrence in Canada, and below is given his reply.

My Dear Prof. Harvey.

Your letter of July 23rd has been forwarded to me. The only place in Canada, from which I have received complaints of *Epochra Canadensis* is British Columbia, where I am told that in many places the black currants are rendered unusuable owing to the numbers of white maggots which came to the surface when these are cooked. This is presumably *E. Canadensis* although I have been unable to secure any specimens. I have received complaints concerning them for the last thirteen years. At one place, Cowichan on Vancouver Island, I was told in 1885 that black currants could not be used at all on this account.

I have been unable to find any specimens in gooseberries, although the large handsome fruit of *Ribes Lobbii* (a gooseberry) is certainly attacked by some larvae on Vancouver Island.

Regretting that I am unable to give you more information.

Believe me to be yours truly,

J. FLETCHER.

Mr. Wm. Cann of Topsam, Maine, writes us that his curants in 1895 were stung and a maggot was formed inside. No specimens were sent, but it was probably the above insect.

From the above data it is quite certain that *Epocha Canadensis*, Loew, is a native American species, distributed throughout the northern part of the United States, and in Canada, extending from the Atlantic to the Pacific coast. It will be interesting to determine whether it infests native currants and gooseberries and from them has transferred it depredation to the cultivated varieties.

Observations—How Does the Fly Oviposit.

She runs over the currant in a nervous restless manner keeping the wings in a constant fanning motion. Often examines carefully several currants before finding one to her fancy. Usually one of the large currants in the upper part of a bunch that is in the shade is selected. Then coming to rest the last three segments of the abdomen are turned at quite an angle forward under the abdomen. The hind feet are set bracing backward and outwards. Then the truncate end of the last segment rests on the currant and the ovipositor is protruded making a puncture. The probing continues very rapidly for fully five minutes at least, a plunge is made in every second. The last segment is occasionally raised during the process showing the protruded sheath of the ovipositor and the ovipositor inself. Finally the plunging motion changes to a vermicular movement of the abdomen to expell the egg which lasts about half a minute when the ovipositor is withdrawn, and the deed is done. The mouth parts are constantly in motion during the process. But one egg is laid in a place.

Nature of the Reproductive System.

We dissected several females and found the ovaries double. The eggs giving the abdomen a swollen appearance and filling the abdominal cavity. The egg masses consisted of about ten chains of eggs on each side, each chain in about ten stages of development, making the possible number of eggs the flies are capable of laying fully 200. The developmental stages are strikingly like those of *Trypeta pomonella*, figured in our 1889 Report, and as in that insect the egg laying period must extend over considerable time.

When Do the Flies Emerge.

Specimens kept in jars in a warm room began to emerge the last week in April, but in nature were first noticed about June first. They were mating at that date and punctures on the currants were abundant indicating an earlier emergence than June 1st. The time varies with the season and locality. No flies were seen in 1896 before June 5th.

How Long Do They Continue on the Wing.

Specimens were quite abundant about the first of June, were most abundant from June 9th to 15th, and by June 25th more were to be seen about the bushes. Making allowance for difference of time of emergence the period of flight would not be over a month at the longest.

What Is the Nature of the Puncture.

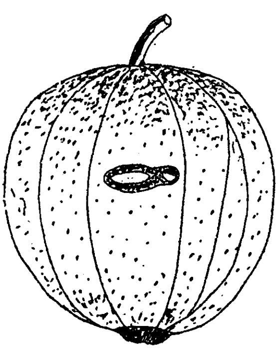


FIG. 7-a. Currant showing the relative position of the puncture and deposited egg.

It is scarcely visible at first but soon becomes surrounded by a brown areola and then is shown to be nearly circular and about a half mm. in diameter. Extending from it at one side is a narrow portion of the epidermis from which the sub-epidermal cells have been removed by the ovipositor, giving it a semi-transparent appearance through which the egg can be clearly seen close under the skin to one side of the puncture.

This portion of the epidermis covering the egg soon becomes whitish, opaque and sunken. We were at a loss at first to know how the egg could be deposited so close to the skin at one side of the puncture but a study of the protruded ovipositor shows that it turns backward at right angles near the end, so that the egg is inserted at an acute angle backwards to the position of the last segment of the abdomen during the deposition. An examination of Plate I, Fig. 9, which shows the protruded ovipositor will make this plain. The end of the egg opposite the pedicel is the one inserted first as shown by the eggs in the oviducts and the position of the deposited egg to the puncture. It is from this end that the larva emerges. We have in this species another instance of deposition of the egg under the skin of the fruit by means of a sharp ovipositor, as in *Trypeta pomonella*, Walsh.

Egg Laying Period.

The eggs are laid one in a place occupying about five minutes for the deposition. The insects are capable of laying fully 200 eggs. The time they are on the wing is about three weeks. This would require that several be deposited each day. An examination of the ovaries showed that about two eggs of each chain or about twenty were practically perfectly developed. The short life period would require rapid maturation of the eggs. If ten were laid each day three weeks would be required to complete ovulation. They may be deposited even faster than this.

The Flies Single Brooded.

Specimens of the pupae taken from the ground under the bushes, about the time the currants were mature, remained in the ground in a warm room all winter but did not emerge until April. Those in nature emerged about June 1st. The insect therefore spends about eleven months of the year in the ground.

How Long Does It Take the Larvae to Mature.

The larvae began to emerge June 20th. An examination of many currants at that date showed that quite a per cent contained full grown larvae. The deposition of eggs began about June first which would indicate three weeks as the time required for full growth. As we found at this date larvae from two mm. to seven mm. in length it would extend the time that the fruit is infested from the laying of the first eggs to the maturity of those last laid which would be fully six weeks. Our observations indicate that the larvae do not leave the fruit as soon as matured which would extend the time still farther. We had some larva pupate as late as July 15th.

Nature of the Work of the Larvae.

When hatched the larva is about one mm. long and as soon as it emerges from the egg begins to travel, often leaving a delicate light colored trail close under the skin which can be seen through it. This is not always the case. After traversing from a third to a half the distance around the currant it locates, entering in most cases one of the seeds, disappearing entirely within it. Sometimes the larva locates near the puncture and sometimes the exit hole is on the opposite cheek from the puncture. As it grows the head finally protrudes from the seed as shown in Plate I, Fig. 7. After feeding upon the contents of a seed and having grown too large to find lodgment within it, it locates between the seeds in the pulp and then gnaws holes in the seeds eating the contents of one after another until often the contents of at least half a dozen are consumed before the larva is grown. They seem to reject the coats and the clear gelatinous envelope that surrounds the seeds. The refuse of the seeds eaten turns black and becomes cemented together. A black spot becomes visible through the skin. The location of the larvae can be told readily as the currants infested soon begin to show a clouded appearance where they are located. That cheek turns red earlier and rapidly a deeper red and finally a black spot. Infested fruits ripen earlier. Often half grown larvae will be found with the head end half buried in a seed. Finally when full fed the larvae gnaw to the surface and cut a circular hole about 1.5 mm.d. through the epidermis by means of which they emerge with ragged edges.

DO THE CURRANTS DROP WHILE THE MAGGOTS ARE STILL IN THEM.

On June 22nd we collected several hundred currants that had fallen on the ground. One hundred of them were carefully dissected and every one contained a maggot excepting two from which the maggots had emerged leaving the evidence of their work. (We put about two hundred of the currants in a box and on June 24 twelve pupae were found.) The maggots were of various sizes from 2.5 mm. to 7 mm. showing that the currants often drop before the maggots are mature. On the same date we took quite a number of currants from the bushes that were turning red. They were the large ones at the base of the bunches and invariably were infested by a maggot. The maggots were of various ages, some full grown, but would not average as large as those found in the currants on the ground.

DO THE LARVAE LEAVE THE FRUIT AS SOON AS IT FALLS.

An examination of currants picked from the ground under the bushes contained larvae of various ages, 7 mm. 4 mm. 3 mm. and 2 mm. in length.

Put quite a number of infested currants in a box June 22nd and some of them did not emerge and pupate before July 15th. The most however emerged in five days.

Quite a number of currants were found on the bushes containing evidence of aborted work showing some mishap to the egg or developing larvae. There were others which showed an exit hole proving that quite a number of the maggots drop to the ground from the currants before they fall. Quite a number of currants showed more than one egg puncture and several from two to three live and flourishing larvae.

Are All of the Fruits in the Bunches Affected.

The inflorescence of the currant is racemose and the fruits at the base develop first and are first in condition to receive eggs. In these the earliest laid eggs are placed. The currants at the ends of the bunches were exempt and ripened good fruit after the flies were done ovipositing.

Where Does the Insect Spend the Winter.

When the larvae are ready to transform they crawl out of the currants and enter the ground a short distance if it is suitable, or they may transform on the surface under rubbish. They may be found in abundance in the ground under the bushes in the fall. The larval skin is not cast but the larva shortens up becoming a coarctate pupa of a pale yellowish brown color. In this condition the insect spends eleven months of the year gradually undergoing changes into the fly which emerges the following season.

General Description.

Perfect insect a two-winged fly about the size of a house fly. Pale yellow or orange with greenish iridescent eyes and dark bands across the wings. Found about currant and gooseberry bushes during June in Maine. Stings the currants, depositing an egg under the skin, that hatches and develops into a small white maggot causing the fruit to turn red and drop prematurely. The maggots when grown leave the fallen or hanging fruit, enter the ground, change to the pupa state from which the fly emerges the following June.

Technical Description.

Female Fly—Pale clay-yellowish or in darker specimens pale orange. On the border of the front on each side, are three or four long, but rather weak black bristles which curve toward each other. Between the ocelli and the last bristle on the border of the front is a single bristle that curves toward the vertex. On the vertex near the eye two bristles the inner much longer. Antemae darker yellow than the head, third joint rounded at the tip; arista blackish, yellow towards the base, with a very short pubescence. Rostrum and palpi pale yellow, the latter not reaching beyond the anterior edge of the oral opening. Thoracic dorsum with a very thin, whitish bloom, a double middle stripe and a narrow lateral stripe, rather shining and somewhat darker than their surroundings. The posterior end of the thoracic dorsum and the scutellum, shining, very pale yellow; a not very broad yellowish stripe runs from the humeral corner to the root of the wings. The scutellum convex and not very large; bristles on the scutellum four. The bristles of the thorax and of the scutellum, as well as the short pile of the thoracic dorsum, are black. Metathorax distinctly infuscated on its superior margin and its middle line. Abdomen shining, with short black pile; the fourth and fifth segments marked by a chestnut brown or black cross band interrupted in the middle, the third usually and sometimes the second segment with a lateral beginning of such a stripe indicated by a chestnut-brown or black spot. Pale specimens without abdominal markings excepting upon the long seventh which in all specimens is dark on the proximate dorsum and at the distal end. Seventh segment equal to the three preceding segments taken together, very broadly truncate and infuscated at the end.

The seventh segment contains the retractile sheath of the ovipositor and the ovipositor. The sheath is clyindrical,broadest at the ends. Clothed with retrorse scales arranged in six longitudinal bands at the base which are brownish toward the end and becoming black near the base. Toward the end the scales become smaller and cover the whole surface, and at the middle the six bands are merged into four.

The ovipositor provided with two guides which are flat, obtuse at the ends and extend three-fourths its length. The ovipositor brown, flat, serrate on the edges, each edge with three teeth. The basal tooth remote. Both faces of the distal lateral teeth each bear two rows of five black bristles. See Plate II. The tip pointed. The principle is that of a double edged serrated hay knife or a *Crysty Bread Knife.*

The front femora are sparsely beset with bristles upon the upper and under side; the middle femora are entirely without bristles; upon the hind femora, likewise, there are only a few bristle-like hairs before the end of the upper side; the upper side of the hind tibiae is merely beset with exceedingly short bristle-like hairs. Wings of the usual shape, hyaline, with a pale-brown picture or in darker specimens nearly black; it consists: 1. In an oblique half cross-band running from the humeral crossvein to the basis of the second basal cell; 2. Of a crossband parallel to the first, abbreviated behind, which begins at the stigma, near the anterior margin, and runs across the basis of the submarginal cell, as well as across the cross veins, which close the second and third basal cells, and thus reaches the sixth longitudinal vein; 3. Of a rivulet which begins above the posterior crossvein, near the third longitudinal vein, runs from it across the posterior crossvein as far as the posterior margin, is continued along this margin inside of the third posterior cell, but, before reaching the sixth longitudinal vein, is suddenly turned upwards, running parallel to the band which begins at the stigma, crossing the small crossvein, and thus reaching the anterior margin, where, gradually expanding, it forms a border ending a little beyond the tip of the fourth crossvein. The two cross-bands as well as the rivulet, are of moderate breadth only; the latter has, in the described specimen, the following faded spots, which, in more fully colored specimens, are probably less apparent or altogether absent. 1. A rounded spot in the marginal cell, above the origin of the rivulet; 2. Upon the longitudinal axis of the submarginal cell an indentation in the inner margin of the section bordering the apex of the wing; 3. Upon the longitudinal axis of the first posterior cell an interruption of the rivulet at its origin and an indentation in the inner margin of the portion bordering the apex of the wing; 4. Upon the longitudinal axis of the discal cell a narrow interruption of the section, running again towards the anterior margin; 5. The spot upon the posterior margin connects the first, descending, portion, with the second, which rises again upwards. The first and third longitudinal veins are bristly; the third and fourth are parallel towards their end, both very gently curved backwards; the section of the fourth vein preceding the discal cell is gently, but rather distinctly arcuated backwards, so that the shape of the discal cell somewhat reminds of that of the species of Rivellia; the crossveins are comparatively rather long, moderately approximated, their distance being about equal to the length of the posterior crossvein; the latter is rather steep, however, perceptibly approximated to the apex with its anterior end, more than with the posterior; the posterior corner of the anal cell is very much drawn out in a point.

Male Fly—Pale clay yellow to pale orange. Smaller than the female and the color and wing picture the same but paler. The head and eyes as in the female. In front view about as long as broad with mouth up, anterior distance between the eyes only half as great as the posterior. The three ocelli brownish. Three long, weak black bristles upon the border of the front as in the female. On the occiput just above the neck are two clusters of six black hairs each, that lie parallel to each other. The antennae darker yellow than the head. The terminal joint twice as long as broad, rounded at the end and not reaching the mouth. Palpi and rostrum yellow the former not reaching beyond the mouth. Arista black, pubescent yellowish at the base.

The thoracic dorsum bears a faint double median stripe and also a narrow lateral stripe. The pollinosity in our specimens seems to be continuous over the whole surface and not absent from the stripes as described by Loew. The entire thoracie dorsum covered with short black hairs excepting the posterior portion. The scutellum is naked excepting that it bears *four long black bristles.* Post border of scutellum dark colored and together with a median dark stripe on the posterior metathorax makes a T shaped marking. Sides of thorax armed with five long black bristles. Four shorter weaker hairs on anterior of thorax. Halteres pale.

Femur of the anterior pair of legs armed with long black bristles. Femur of other legs unarmed. The two posterior legs darker. Abdomen oblong, arched, width to length as 5:8. Composed of six segments, ratio 3:4:4:4:5:2. The basal bears an obscure median dorsal brown spot. The posterior portion of the abdomen darker yellow.

Fourth and fifth segments each bear an obscure brown spot on the lateral dorsum. Part border of the narrow sixth segment dark brown but usually turned under the abdomen so that from above the end of the abdomen appears yellowish. There is a row of ten long bristles on the posterior border of the fifth segment (see Plate I, Fig. 10.) Attached to the lower surface of the sixth segment is the external genital apparatus composed of claspers, guide and penis. The claspers are club-shaped and notched near the posterior end on the interior edge. The guide between the claspers is a horse hoof shaped organ half as long as the claspers ending in a tuft of hairs and backward narrows into a small pedicil. The penis is exceedingly long, bearing at the end an enlargement to which is attached a pedicilate pear-shaped appendage. See Plate I, Figs. 8 and 10.

The wings as in the female.

Measurements of Male Fly.—Total about 6.5 mm. Head .931 mm. long, depth .1064 mm. exclusive of rostrum, breadth 1.729. Width of eye from dorsal view .399 mm. Front view nearly round, about .745 mm. with mouth up anterior distance between eyes .675 mm. posterior, 1.33 mm. Arista 2.93 mm. Thorax 2.13 mm. long. Abdomen 3.46 mm. long, 1.33 mm. wide. Segments in the ratio 3:4:4:4:5:2.

Eggs—Opalescent white, oblong, pedicelate. The pedicelate end more pointed than the other which is somewhat obtuse. The pedicel with a short narrow neck and bulbous at the end. The pedicelate end for about one-third of the length sculptured by raised lines arranged in a hexagonal pattern giving a rough pitted surface, most conspicuous near the pedicel and gradually lost in the smooth surface of the opposite end, about four and a half times as long as wide. They measured 1.064 mm. by .24 mm. in one specimen and 1.04 mm. by .25 mm. in another. (Plate I, Fig. 2.)

Larva—Length 7 mm. (.28 in.); breadth 1.5 mm. (.06 in.) White with sometimes a faint rosy tint, probably due to absorption of the colored juice of the currant. Footless body composed of about thirteen segments. Widest in the middle, tapering rapidly toward the head, which is small, pointed and emarginate. (Plate I, Fig. 3.) The mouth circular surrounded by a zone of ridges and furrows. From the mouth protrudes two curved parallel retractile black hooks, the *rasping organs* of the larva, by means of which it gnaws the fruit. (Plate I, Fig. 6.) The chitinous frame work to which these hooks are attached shows as a black area in the second and third segments. These hooks and frame work give the end of the head a black appearance. There are two pairs of tubercles upon the front of the first segment. The lower pair smaller. (Plate I, Fig. 6.) The cephalic and candal spiracles are yellow. The former between the third and fourth segments and lacerate funnel formed. The latter are on the posterior face of the last segment and end in three finger like thorns. (Plate I, Fig. 5.) These are connected by trachea with large anastomosing branches at the posterior and anterior ends. The larva when first hatched is about 1 mm. long, and slender

This larva looks much like that of *Trypeta pomonella* and could not be separated without a hand glass, but the mouth, head and candal spiracles are quite distinct.

Pupæ—Five mm. long by nearly 2.5 mm wide, broadly oblong, straw colored, coarctate. The head end more pointed and showing the cephalic spiracles. The candal spiracles also apparent. In emerging the fly breaks away the lower half of the first four cephalic segments. The pupa is shown in Plate I, Fig. 4.

Critical Remarks.

Mr. Loew says in the introduction to Part III of his "North American Diptera" (Smithsonian Miss. Colls. p. 213) I have been compelled to draw the descriptions of several species from single, often badly preserved specimens, and I am afraid that these descriptions * * * may sometimes betray the incompleteness of my material." Appreciating this fact the critical remarks made below are not given in the spirit of a criticism but to supplement what has been written after the careful examination of an abundance of material. Loew must have examined faded or pale colored specimens as the larger and better developed individuals have the abdominal markings dull black and also the markings on the wings are much too dark to be described as having "a pale brown picture." There are occasionally females with slender abdomens which are without markings. These seem to be *unimpregnated* or possibly through ovipositing. The intensity of the color in others is variable. There is a dark uninterrupted band across the posterior border of the sixth segment. Loew calls the last abdominal segment of the female the ovipositor, a mistake which entomologists made in regard to *Trypeta pomonella*, Walsh. The last abdominal segment is about as long as the three preceding, conical, truncate at the end, and retracted within it are sheath and ovipositor. Mr. Loew evidently did not see the ovipositor which we have described and figured. (See Plate II.) He also makes a mistake regarding the number of abdominal segments, there being *seven* the one at the base having been overlooked. Therefore, the description given by Loew, "the third and fourth segments have, each at its basis, a chestnut cross band interrupted upon its middle, while upon the second segment only a lateral beginning of such a stripe is indicated by a chestnut brown spot," would have to be corrected by saying fourth and fifth and third segments respectively. Mr. Loew is in doubt regarding the number of bristles upon the scutellum, which we find is four upon *both* male and female. In the brighter colored flies there is a decided orange tint, which would require a modification of the statement that the color is "pale clay yellowish." We find that the number of bristles on the border of the front is usually three on each side; but it varies from two to four. In some specimens three on one side and four on the other. Mr. Emerton's drawing (Plate I, Fig. 1) shows four.

Saunders says it "lays its eggs on the currants while they are small." Our observations are that the eggs are inserted under the skin through a small hole made by the sharp ovipositor, and that the currants are quite large before the eggs are laid, and that the largest ones at the base of the bunches are usually selected first. He also makes a mistake when he states that the larvae leave "a round, black scar at the point of entry." The young larvae usually travel some distance from where the egg is deposited before establishing headquarters. The black scar locates the larva, and results from the decomposition of the parts injured and the exuviae of the larvae. The *exit* hole of the larva is usually located in the black scar. The puncture made to lay the egg is too small to be noticed excepting by close examination. He also says the insect "probably passes the chrysalis state in the ground, a guess which is confirmed by finding the pupae in abundance in the ground under the bushes.

Prof. Snow correctly doubts that the abdomen of the male is "short and rather broad," but the black of the abdomen in well colored specimens is natural. The abdomen of the female varies from very narrow in unimpregnated specimens or those through depositing to every broad in those full of eggs. The abdomen of both shrivel and change form in drying, and the colors are duller. The abdomen of the male has but six segments, and from that reason is shorter than that of the female though the segments preceding the sixth are larger than those of the female.

We are at a loss to know how Prof. Snow can arbitrarily "consider six as the number of segments composing the abdomen of the female trypetid and five as composing that of the male," when nature has decided the matter by giving the former seven and the latter six. Certainly it can lead to nothing but confusion as has Loew's discrepancy in the correct number. We can't even see any good reason for longer perpetuating the error that the long terminal abdominal segment is the ovipositor, for it certainly has nothing to do with ovipositing. It is not inserted at all into the puncture and merely has the ovipositing apparatus attached to it and when not in use telescoped within it. The fine plate which we give of the ovipositor from the pen of Mr. Emerton should settle this matter.

There are also six well defined segments separated by sutures in the male abdomen in front of the external male genitalla as shown in Plate I, Fig. 10. The terminal segment is, however, short.

Prof. Gillette's observations of the habits of this insect agree with ours very nearly, though he studied its work upon gooseberries instead of currants. We are, however, of the opinion that the currants stung remain on the bushes much longer than he records for gooseberries, and that the red spot develops where the larvae is located instead of where the egg is deposited. In currants the egg is not laid in the pulp, but at one side of the puncture close under the skin, so it can readily be seen through it.

The figure of the fly given shows but four abdominal segment, anterior to the long terminal one while there are really six. The thorax dorsum is not of uniform color as shown, but is faintly double striped down the middle and at the sides by the absence of the whitish bloom that covers the upper surface. See Plate Fig. 1. The thorax is too long and the head too narrow and small.

We find that quite a number of the maggots leave the currants before they drop. This may not be so with gooseberries. For currants we can not recommend gathering the fallen fruit as only a partial remedy.

Remedies.

We have had no experience with this insect as it is new to Maine as an injurious species. From a study of its life history we discover only one vulnerable point. The insect spends eleven months of the year in the ground and can not be reached. In the winged stage it cannot be destroyed so far as we know. The eggs are deposited under the skin of the fruit and spraying would do no good. *Part of the infested fruits drop prematurely and the worms remain in them for some time before they emerge and go into the ground.*

(a) Based upon this last habit we would recommend gathering up the fallen currants frequently and burning them.

This remedy cannot be relied upon to destroy *all* the flies as quite a number of maggots leave the fruit before they fall. It can be depended upon to destroy fully half if not more and can be employed to keep them in check.

(b) As these flies are weak and liable to perish if any obstruction is offered to prevent their coming out of the ground,we would recommend a mulching of coarse straw or hay, several inches deep, placed under the bushes and out as far as the branches extend, and well packed.

(c) As the larvae find fine dry dusty substances prejudical to their transformation a heavy dressing of coal ashes placed under the bushes in June would destroy many of the larvae and also prevent the flies from emerging the following spring. Prof. Jordan tried this on his garden without flattering results.

(d) Our western correspondent Dr. W. A. Thornton thinks that allowing young chickens about the bushes early in the season and large fowls later after the fruit is gathered will keep them in check.

(e) A radical remedy would be to pick and destroy the crop after the eggs are largely laid and before the currants drop, or pick the entire crop while green and before the flies appear. If there are no currants of course no eggs could be laid, and the flies would have to go elsewhere or perish.

(f) As the pupae are found only about an inch below the surface, they could be destroyed with little trouble by removing the soil to that depth from under the bushes and burying it deep or depositing it on a road or some exposed place.

(g) We have not discovered any parasites to help check the pest. Short bearing years would tend to reduce the numbers.

Maine State College Experiment Station Report, 1895. Plate I.

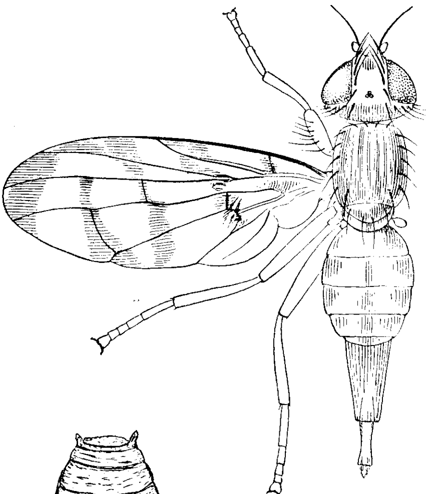


Fig. 1.

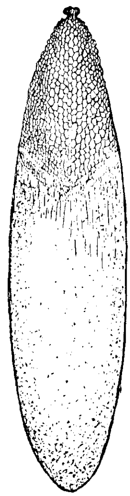


Fig. 2.

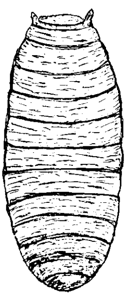


Fig. 4.

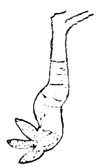


Fig. 5.

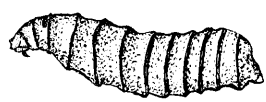


Fig. 3.

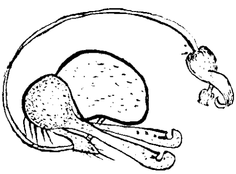


Fig. 8.

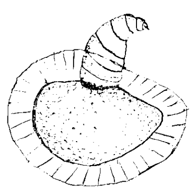


Fig. 7.

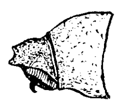


Fig. 6.

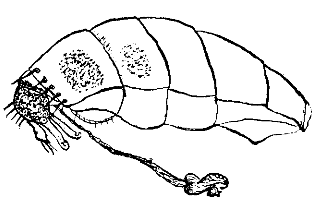


Fig. 10.

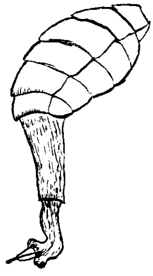


Fig. 9.

The Currant Fly, Gooseberry Fruit-Fly.
(*Epochra Canadensis, Loew.*)

EXPLANATION OF PLATE I—THE CURRANT FLY.

(*Epochra Canadensis*, Loew.)

All excepting Figure I were drawn by the writer.

Figure 1. The female fly enlarged about seven and a half times. Drawn by Mr. J. H. Emerton from slides of the wing and ovipositor prepared by the writer and from pinned flies. The two basal joints of the abdomen are drawn as one. The real number, including the long terminal segment is seven instead of six.

Figure 2. Egg showing form, sculpture and pedicel, enlarged fifty times.

Figure 3. The larva enlarged about five times.

Figure 4. The pupa enlarged eight times.

Figure 5. The candal spiracle of the larva much enlarged.

Figure 6. First two segment of the head showing the tubercles on the head, the rugose mouth and the rasping organs. Enlarged twenty-five times.

Figure 7. Seed of currant with gelatinous envelope showing larva protruding from it. Enlarged.

Figure 8. External genitalia of male. Enlarged twenty times.

Figure 9. Side view of abdomen of female with ovipositor protruding and bent backward in the position it takes as the egg is deposited under the skin to one side of the puncture. Enlarged.

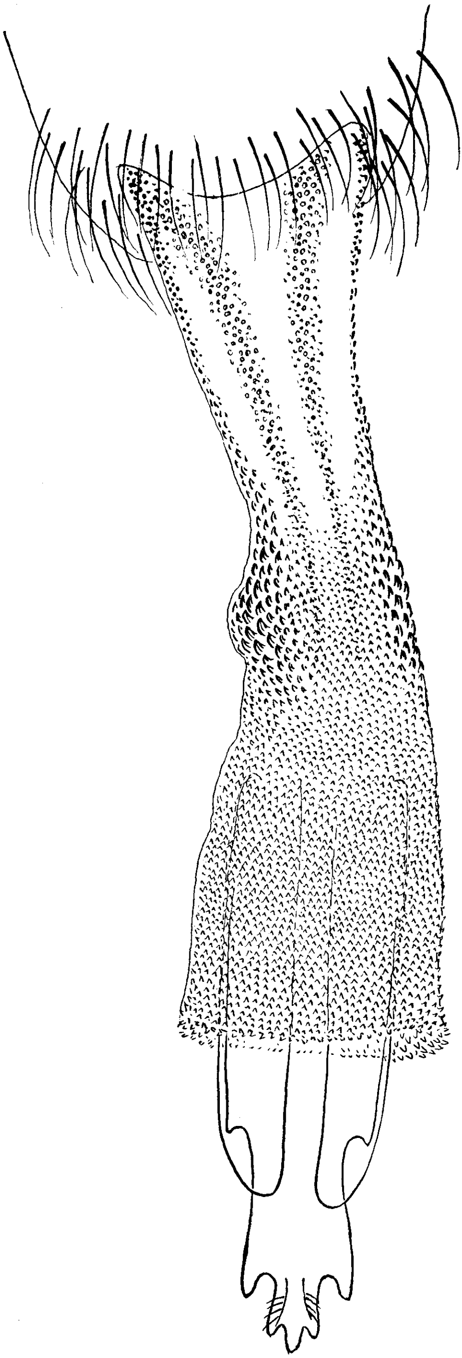
Figure10. Abdomen of male with gentalia and showing six segments. Enlarged.

EXPLANATION OF PLATE II—THE CURRANT FLY.

(*Epochra Canadensis,* Loew.)

This plate prepared by Mr. J. H. Emerton from dissections made by the writer, shows the end of the last abdominal segment; the sheath of the ovipositor; the guide; the ovipositor; the bristles terminating the abdomen; the triangular scales that point backwards and cover the most of the sheath; the teeth upon the ovipositor and the small bristles near the end.

When not in use the ovipositor and guides are telescoped into the sheath and the sheath into the long terminal abdominal segment. The figure is enlarged one hundred and twenty times.



The Currant Fly, Gooseberry Fruit-Fly.
(*Epochra Canadensis, Loew.*)

APPENDIX.

Bulletins Issued in 1895.

BULLETIN No. 17.

IMPORTANT FACTS ABOUT CORN.

Bulletin No. 11 of this Station treats of the relative yield of mature Maine Field Corn and immature Southern Corn.

The data collected during a study of this matter show certain allied facts that are of much importance to the farmer who is planning to produce corn the coming season as a fodder or silage crop.

Composition of Mature Maine Field Corn and Immature Southern Corn.

Analyses of the experimental crops of corn on the College farm reveal the composition displayed below.

Crops of 1892 and 1893, average.	In 100 Pounds Green Corn.						
	Water —lbs.	Dry substance —lbs.	Ash—lbs.	Protein Nx6.25 —lbs.	Fiber—lbs.	Nitrogen free extract—lbs.	Fat—lbs.
Southern corn, immature	84.80	15.20	1.18	1.78	4.20	7.70	.34
Maine field corn, mature.	78.91	21.09	1.28	2.28	4.15	12.77	.61
Excess in field corn..........	-	5.89	.10	.50	—.05	5.07	.27

It appears from these averages that under the conditions existing in Maine, which require the cutting of the large varieties of corn in an immature state, the Maine field corn which reaches maturity, contains the larger percentage of dry matter. Again, the excess of dry matter in the Maine field corn consists almost wholly of the non-nitrogenous compounds classed under the head of nitrogen-free-extract.

The Maine Field Corn is in this case worth forty per cent. more than the immature Southern Corn, pound for pound, judging simply by the per cent. of dry matter. The great bulk of the Southern Corn fodder is not a proof of greater or even of equal value.

THE EFFECTS OF MATURITY UPON THE MAINE FIELD CORN IN COMPOSITION AND YIELD.

Composition: In order to obtain testimony on this point, in 1893 a field of Maine corn was cut in five different lots, ranging in times of cutting from August 15th to September 21st, and in stage of growth from the early formation of the ear to full maturity. The analyses of samples from these different cuttings appear below.

	IN 100 POUNDS GREEN CORN.						
	Water—lbs.	Dry substance—lbs.	Ash—lbs.	Protein Nx6.25—lbs.	Fiber—lbs.	Nitrogen free extract—lbs.	Fat—lbs.
Maine field corn, cut Aug 15	88.29	11.71	1.09	1.75	3.10	5.46	.30
Aug. 28.....	82.50	17.50	1.14	2.05	4.08	9.71	.52
Sept. 4......	80.45	19.55	1.21	2.22	3.85	11.68	.59
Sept. 12.....	76.83	23.17	1.29	2.22	4.48	14.50	.68
Sept. 21.....	74.66	25.34	1.50	2.34	4.71	16.04	.75

The immature and mature corn differ in the following essential particular:

The mature corn is less watery; i. e., it contains a much larger percentage of dry substance. During the thirty days before the mature crop was harvested there was a continuous and large increase in the percentage of dry matter. It will appear later that this was mostly due to an actual growth of dry matter, rather than to a drying out of water.

Yield: The field of corn selected for studying the influence of maturity upon the yield was of very uniform growth, being finely eared and in every way satisfactory for experimental purposes.

Each of the ten plots consisted of five rows, and it was decided to harvest one-fifth of the crop or one-tenth of an acre at each of five periods of growth, cutting one row of each plot at each period.

Date of cutting and condition of crop.	Days in each period of growth.	Yield Per Acre. Green corn.	Yield Per Acre. Dry substance.	Gain in weight in each period, dry matter—lbs.	Rate of gain per day, dry matter—lbs.
August 15, ears beginning to form........	....	26,166	3,064.0	....	....
August 28, a few roasting ears	13	29,777	5,210.9	2,146.9	165.0
September 4, all roasting ears	7	31,000	6,060.5	849.6	121.3
September 12, some ears glazing	8	28,833	6,680.6	620.1	77.5
September 21, all ears glazed	9	27,777	7,039.7	358.1	39.8
Increase dry matter after August 15 .	......	....	....	3,974.7	....

The results of this experiment certainly furnish a striking illustration of the folly of harvesting immature corn for silage or fodder purposes whenever it is possible to allow it to attain maturity.

In this instance, *the total quantity of dry matter in an acre of the corn at maturity was nearly two and one-half times greater than at the silking period thirty-seven days previous,* the average rate of increase of dry substance per acre being about 108 pounds daily. This daily increase is equivalent in quantity to one day's ration for four or five cows of ordinary weight.

The Influence of Maturity upon the Quality of the Dry Matter in the Corn Plant.

It is well known that the portion of the plant known as nitrogen-free extract is a mixture of substances such as sugar, starch, gums, waxes, etc., some of which have a higher value than others for use by the animal. In short, the larger the proportion of starch and sugars in the nitrogen-free-extract of a food, the more highly do we estimate the nutritive worth of that food. For this reason a higher value is placed upon the nitrogen-free-extract of the grains than upon that of the coarse fodders.

It is evident then, that if allowing the corn plant to mature increases the relative proportion of sugars and starch in dry matter, we have not only the advantage of obtaining a larger yield of dry matter but we secure material of better quality for food purposes. The figures show the facts as obtained from a single investigation.

	Proportion of starch and sugars in Nitrogen-free extract.	Pounds of starch and sugars yielded per acre.
	%	lbs.
August 15, ears beginning to form	*25.1	*358.5
August 28, a few roasting ears	40.5	1,172.0
September 4, all roasting stage	42.7	1,545.0
September 12, some ears glazing	42.2	1,764.0
September 21, all ears glazed	50.3	2,244.0

* Probably somewhat too low.

It appears from the figures that not only is there a constant and large growth of starch and sugars up to the condition of maturity of the corn plant, *but these valuable compounds increase more rapidly than certain less important constituents, so that the mature plant substance is of better quality than at any previous stage of growth.*

SUMMARY.

(1.) Under the conditions existing in Maine the varieties of Flint Corn which mature in the state furnish fodder or silage material much more valuable, pound for pound of fresh weight, than it is possible to secure with the larger varieties of Dent Corn which do not mature.

(2.) The Flint varieties of corn should always be allowed to mature, as there is a large and continuous production of plant substance up to the period of full maturity. Harvesting half grown or immature corn is a wasteful practice.

(3.) Owing to the relatively large production of sugars and starch in the late stages of growth, a pound of the dry substance of the mature well-eared corn plant possesses a higher nutritive value than at any earlier stage of growth.

W. H. JORDAN.

MAINE STATE COLLEGE,
ORONO, ME., MARCH 1, 1895.

BULLETIN No. 18.**

INSPECTION OF FERTILIZERS, 1895.

W. H. JORDAN, Director.

J. M. BARTLETT, L. H. MERRILL, Chemists.

The Maine Legislature enacted at the session of 1893, a new law for the regulation of the sale and analysis of commercial fertilizers.

This change of law was sought in order to accomplish two objects:

1. The providing of funds that can be legally used, sufficient to pay the expenses of a proper inspection.

2. A provision whereby information as to the composition of the goods offered for sale can be given to the would-be purchaser at an earlier date than has heretofore been possible.

This law makes the following requirements upon manufacturers, importers or dealers who propose to sell or offer for sale their goods in the State. These briefly stated are:

1. Marking the bags properly.*

2. Filing annually a certificate with the director of the Station giving the manufacturer's or dealer's name, place of business, place of manufacture, name of brand of fertilizer and the guaranteed composition of the same.*

3. Depositing annually, unless excused by the director under certain conditions, a sample of fertilizer, with an accompanying affidavit that this sample "corresponds within reasonable limits to the fertilizer which it represents." These samples are designated in this bulletin as "manufacturer's samples."*

4. The annual payment of an analysis fee of fifteen dollars for every brand of complete fertilizer licensed.

5. All brands of which thirty tons or more are not sold are exempt from the last provision.

The law also imposes upon the Director of the Maine Agricultural Experiment Station certain duties which are:

1. The issuing of licenses to such manufacturers as comply with the above named requirements.

2. The analysis of the samples deposited by the manufacturers.

3. The selection of samples in the open market of all brands of fertilizers sold or offered for sale in the state, with the subsequent analysis of the samples.

4. The publication of bulletins or reports, giving the results of the inspection.

In accordance with the foregoing requirements, eighteen companies representing seventy-two brands of fertilizers have complied with

** Given in part.

* Notice.—That requirements 1, 2 and 3 apply to all brands of fertilizers, whether thirty tons are sold or not.

the law, and the brands mentioned below can be sold legally in the state to the extent of thirty tons or more during the year 1895.

(The bulletin gave the manufacturer's guarantees and the analysis of manufacturer's samples, but as these figures are of only passing value they are omitted here. W. H. J.)

BULLETIN No. 19.

A DISCUSSION OF CERTAIN COMMERCIAL ARTICLES.

(1) FERTILIZERS.

A large sum of money is annually expended by Maine farmers for commercial fertilizers and commercial cattle foods. The trade in these articles offers, therefore, wide opportunities for the practice of fraud, and for the sale of various nostrums and mixtures at prices several times larger than the value to the purchaser of the goods delivered. Through credulity, lack of accurate knowledge and hasty judgments Maine farmers have suffered their fair share financially at the hands of plausible "agents." In too many instances the goods are first bought for cash or on credit, invariably at an unusually large price, and then after the act is past recalling, information is sought as to the character and value of the "fertilizer" or "food" purchased. If accurate information were first obtained in these cases there would be less of these transactions where value is not received for the money paid.

There are two claims which generally characterize the representations of the companies and agents selling these questionable goods:

(1) The process of manufacture is a secret one, having been "discovered" by some one who is generally unknown either to science or practice.

(2) The "fertilizer" or "food" either contains ingredients of which the whole world, outside of a favored few, is ignorant, or else certain ingredients are so wonderfully compounded as to produce marvelous results.

In all instances that have come under the writer's notice such materials have ingredients of some actual value for feeding plants and animals. Are the claims of extraordinary value well founded?

Let us examine some of the cases that have been investigated.

FERTILIZERS.

There is a case in hand just now which well illustrates the sale (attempted at least) of a fertilizer in accordance with claims that cannot be justified by existing knowledge, and at a price greatly out of proportion to the real value of the article.

Reference is made to the fertilizers offered for sale by The Chemical Compound Fertilizer Co., otherwise Mason, Chapin & Co., Providence, R. I.

From the published reports of this company and from the testimony of correspondents, concerning the price asked and the claims made by their agents, etc., we learn:

1st. The compounding of the fertilizers is a secret process. "The exact method in which this is accomplished is a secret of great value to us and which we do not propose to give away to the public."

2nd. The phosphoric acid is classed as "soluble in the soil," which to the chemist is an indefinite and suspicious form of statement.

3rd. No statements are made as to whether the fertilizers contain potash or not. They are advertised as containing certain percentages of "alkali," which may be interpreted as either potash or soda.

4th. Written testimony shows that the agent offering these fertilizers claims that 600 pounds of the form for potatoes would be found equal to a ton of the ordinary superphosphates.

5th. The fertilizers have been offered at the remarkable price of $55 per ton.

Fortunately for the farmers such new materials as the above are, in these days, very soon brought to the test of a severe investigation. Samples of these particular fertilizers have been examined at the Connecticut and Maine Experiment Stations, and the results of the analyses make these peculiar claims appear rather grotesque, and the price highly exorbitant. The following are the analyses:

	Connecticut Analyses.			Maine Analyses.	
	For potatoes—per cent.	For potatoes—%.	For corn—per cent.	For onions—per cent.	For potatoes—per cent.
Nitrogen in nitrates	4.03	3.56	1.47	3.43	3.42
Phosphoric acid soluble in water	.11	.22	.29	....	......
Phosphoric acid "reverted"	2.20	2.38	2.08	1.93	2.11
Phosphoric acid insoluble	11.51	10.08	13.70	13.00	9.48
Phosphoric acid total	13.82	12.68	16.07	14.93	11.59
Potash	....	....	......	.14	26
Valuation	$18 84	$17 23	$12 38	$17 73	$17 14
Selling price	50 00	50 00	50 00	....	55 00

An examination at the Connecticut Experiment Station still more exhaustive makes it evident that the fertilizers are made up by mixing nitrate of soda, some crude, ground phosphate and probably soda ash.

The comments by the Connecticut Experiment Station on these goods and on the lately much discussed value of soda as a substitute for potash, are so entirely clear and sound that they are reproduced here.

"A mixture of 500 pounds of nitrate of soda, costing $12.50, 1200 pounds of basic slag costing $11.40 and 300 pounds of dry carbonate of soda, costing $6.00, total cost $29.90, would contain approximately the same quantities of nitrogen, phosphoric acid and soda and would have at least as great a crop-producing power as these fertilizers costing $50.00 per ton ($55.00 in Maine.)

The only valuable fertilizing ingredients contained in these fertilizers, viz:, phosphoric acid could, however, be bought for not far from $20.00, so that the plant food in these goods costs more than twice as much as the farmer needs to pay for it.

It is claimed that the soda existing in these fertilizers as carbonate and nitrate is an efficient substitute for potash in the plant and in the soil. So far as the plant is concerned a large amount of the most refined investigation would appear to demonstrate conclusively that soda cannot in any sense or to any extent take the place of potash in plant-nutrition. Plants growing in presence of abundance of potash usually take up and contain more potash than they really need. This accidental or unnecessary potash may indeed be replaced by soda, but both may be withheld without detriment to the plant. Even the salt-worts and seaweed which usually grow in soils or water containing much sodium compounds, flourish equally as well in absence of soda,but cannot exist in default of potash.

On the other hand, soda may sometimes or often take the place of potash as a fertilizer. In such cases it operates indirectly, not by entering itself into the crop as a needful food to the plants, but by its action on the soil, making more rapidly available some other ingredient of the soil, it may be potash, or lime or nitrogen, which is there present, but exists in a comparatively inert state. It is well established that the use of soda as a fertilizer has often increased crops, but experience shows that it is commonly an uncertain and unsafe application to land. In any case it does not enrich the soil or increase its stores of plant food, but simply facilitates their solution, consumption, and it may easily be, their waste.

As a rule soils contain more soda than potash and the frequent use of soda in fertilizers tends to exhaust and impoverish the land. If soda is to be used it is most cheaply supplied in nitrate of soda, which by its nitrogen may easily return its entire cost, leaving its soda in the soil as carbonate, and if more alkali is useful, lime is vastly cheaper than soda and not a whit less efficacious, is in fact, what soda is not, an essential element of plant-nutrition, as well as the safest and surest means of fluxing the inert plant-food of the soil and putting its hoarded capital into active circulation."

Bulletin 20 will continue this discussion in the consideration of a certain class of cattle foods.

W. H. JORDAN.

MAINE STATE COLLEGE,
ORONO, ME., MARCH 15th, 1895.

BULLETIN No. 20.

A DISCUSSION OF CERTAIN COMMERCIAL ARTICLES.

(2) FOODS.

A class of materials commonly spoken of as "Condimental" or "patent" foods, has been found in our markets for many years. Now and then a new one appears, as has lately been the case in Maine. These foods are generally given some pretentious name such as "Condimental Cattle Food," "Imperial Egg Food," "Nutriotone," etc. They usually possess an aromatic or other positive odor, which to the uninitiated gives the appearance of value.

The claims that are made for the nutrient and tonic properties of these commodities are fairly startling as lying outside the range of either common experience or scientific knowledge, and on the strength of such claims these wonderful mixtures are sold in most cases at prices ranging from $100 to $2,000 per ton. How utterly absurd both the claims and the prices appear in the light of facts! Repeated careful examinations of these materials show that *without exception they consist principally of common cattle foods, or other common materials, mixed with small percentages of the cheapest and most ordinary medicinal substances.*

The following are the results of a number of examinations made by various experiment stations:

From Rep. Conn. Expt. Sta., 1878, p. 125.

"Condimental Cattle Food," cost $8.00 per 100 pounds. "It consists chiefly of corn meal and bran. It contains enough fenugreek to give it a strong flavor of that aromatic seed and likewise some seeds like caraway in appearance . . . ."

From Rep. Maine Exp. Sta., 1885, p. 52.

"Imperial Egg Food." Cost 50 cents per pound. Chiefly clam and oyster shells with some bone, also some pepper.

Johnson's Continental Food. Cost 75 cents for 10 pounds. "A mechanical examination shows that the food is undoubtedly wheat bran with possibly some middlings." Contains "some fenugreek" and "a little sulphur."

"English Patent Food." Cost $1.00 for a bag of 12 pounds. "Appears to be made up of middlings and corn meal, largely middlings. . . ." Contains "some fenugreek."

From Bulletin No. 20. Mass. Expt. Sta., p. 6.

"The Concentrated Feed." Cost $8.00 per 100 pounds. ". . . A mixture of several ingredients, among them was noticeable common salt."

From Rep. Conn. Expt. Sta. 1888, p. 146.

"The Concentrated Feed for Horses, Cattle, Sheep, Swine, Poultry, etc." "Apparently consists of a mixture of wheat and corn with thirteen per cent. of salt and perhaps a little of some more concentrated food." "Costs $100 per ton in three ton lots, ... $160 per ton in small quantities."

"The Concentrated Egg Producer." Cost $4.00 for 12 pounds, equivalent to $660 per ton. Contains both corn and wheat and some more concentrated food."

From Bulletin 15, N. H. Expt. Sta.

"Pratt's Food." Cost 75 cents for 12 pounds or $6.00 per 100 pounds. The food appears to be wheat middlings to which has been added some fenugreek and common salt."

"Weston's Condition Powder." Cost 50 cents for package of three pounds. "It resembled a mixture of corn meal and cotton seed meal and it had a saline taste and strong odor of fenugreek."

"Climax Food." Cost $1.00 per 12 pounds or $8.00 per 100 pounds. "It resembled a mixture of fine wheat middlings and wheat screenings together with a small quantity of caraway or fenugreek seeds and small bits of a substance like butter-nut or elm bark," also common salt 9.77 per cent., Glauber's salt, 4.50 per cent., and Chili Saltpeter 3.84 per cent.

From Rep. Maine Exp. Sta., 1892, p. 26.

"Pratt's Food." Cost $120 per ton. "Has the appearance of being chiefly ground bran or shorts. Contains a small amount fenugreek." . . . . "Contains something less than three per cent. of common salt."

From Rep. Conn. Expt. Sta. 1893, p. 244.

"Nutriotone." "It contains a considerable quantity of some leguminous seed, some linseed meal and perhaps other feeding stuffs together with aromatic substances (fenugreek, anise seed, caraway and the like,) and over ten per cent. of salt."

"Silver Live Stock Powder." Cost $1.00 per pound. "Consists essentially of ground bone having a dark color and slight odor of coal tar."

From Crop Bulletin No. 6, 1894, Me. Board of Agr.

"Nutriotone." Cost 25 cents per pound. (Sold in some cases for $7.00 for 50 pounds.) "Consisted largely of linseed meal with a litle fenugreek and apparently some pea or bean meal. It contained 18.67 per cent. ash, a large part of which was common salt."

The following are some of the statements that have been made by men who are students of animal nutrition, in regard to condimental cattle foods in general.

"Mr. Lawes of Rothamstead, England, made a most thorough, practical trial on the use of condiments in feeding, and demonstrated that there is no profit in it."—*Rep. Conn. Expt. Sta.. 1878, p. 125.*

"The foods have no greater nutritive value than wheat bran, middlings and corn meal from which they are made, while the small quantities of fenugreek and sulphur are utterly valueless to a well animal, and a poor reliance as a means of curing a sick one."—*Rep. Maine Expt. Sta., 1885, p. 53.*

"The practice of buying *compound* feeding stuffs in the general market, without a sufficient *actual* knowledge regarding the kind or the character of its various ingredients, ought to be decidedly discouraged; for the farmer who pursues that course, leaves his best interest to mere chance."—*Mass. Expt. Sta., Bul. 20, p. 7.*

"It has been abundantly proven that condimental foods have no advantage over others by reason of the condiments in them. As medicines they may well be distrusted in view of the absurd claims made by the seller."—*Rep. Conn. Expt. Sta., 1888, p. 148.*

"Quack horse doctors and Concentrated Cattle food manufacturers are twins, and they flourish, not on the ignorance of farmers, but on that lingering remnant of old times, which made saltpeter and sulphur the universal cure-all for horses and cattle. .... The foods reported below are worth only from $20 to $25, per ton. ...... So far as the medicinal claim is concerned, ... even the treatment of a 'Quack' is better, and certainly cheaper, than the wholesale use of mixtures of unknown composition."—*Bul. 15, N. H. Expt. Sta., p. 3.*

Facts To Be Remembered.

(1) The mixture of ingredients contained in the ordinary foods comprises all that are known either to practice or science as useful to animal life.

(2) The ordinary cattle foods supply animal nutrition in the most useful and economical forms.

(3) Condimental foods are absurd as medicines. If an animal is well no medicine is needed, if ill, remedies adapted to the case should be administered.

(4) The farmer could manufacture his own "condimental" foods at a fraction of their usual cost, by mixing a small amount of such common sustances as salt, sulphur, saltpeter, fenugreek, caraway, &c., with the daily grain ration.

W. H. JORDAN.

MAINE STATE COLLEGE,
ORONO, ME., MARCH 25, 1895.

BULLETIN No. 21.

NOTES ON SMALL FRUITS.

The progress made in the culture of small fruits during the past twenty years has been rapid and substantial, but even at the present time the importance of this branch of horticultural work is not fully recognized by the people of the State. From the very nature of the soil and climate of Maine we must look to intensive rather than to extensive operations for the most profitable returns. At the present time there is no line of work which seems more promising than that of the culture of small fruits. With the increasing importance of our summer resorts, new and extensive markets are opened; while the operatives in the factories are always large consumers of fruit.

The purpose of this Bulletin and of succeeding ones is to give brief, concise hints on the culture of small fruits and information concerning some of the more important varieties.

The essential elements of success in small fruit growing are: suitable location; thorough preparation; the best varieties; careful planting; thorough culture; the application of business principles in marketing.

THE STRAWBERRY.

A warm, rather moist sandy loam is usually preferred in growing this fruit, but in general any soil that will raise a good crop of corn will raise good strawberries. I would not be understood as encouraging neglect in any way, but the minute directions sometimes given for preparing the soil and for planting are misleading and are enough to discourage any novice from attempting to grow fruit.

Thorough drainage, either natural or artificial, is absolutely essential, and thoroughness in the preparation of the soil is of prime importance, but the excessive applications of manure and the hand labor frequently advised are unnecessary. It is well to grow some hoed crop as corn or potatoes on the land for one or two years before setting the plants, as in this way there is less danger from attacks of the "white grub."

The month of May is, perhaps, the best time for setting strawberry plants in this latitude, though good results often follow fall setting. Two very important considerations in setting the plants are that the crowns be just even with the surface of the earth and that the soil be pressed firmly about the roots. These points cannot be too strongly emphasized, for to their disregard may be traced more than half the failures in starting new plantings.

For general field culture the "matted row" system is probably best. The rows should be as long as convenient, that most of the labor of cultivating may be performed with a horse. The plants should be set eighteen inches apart in rows which are about four feet apart. Thus placed, a little more than seven thousand plants will be required for an acre. During the first season thorough culture should be practiced. It is also well to keep the runners cut back till the parent plants are strong and well developed.

Winter protection of the plants is always advisable. The value of such treatment is two fold: Not only are the plants protected from injury, but the fruit is kept clean and bright. The best material for the purpose is coarse meadow hay cut before the seeds have ripened. We have sometimes used "shingle edgings" with very satisfactory results. In the vicinity of large mills this material may often be obtained much more cheaply than the hay.

On light gravelly soils we have sometimes resorted to the use of boards on each side of the row of plants as illustrated below:

This device is found a very satisfactory means of conserving moisture and will permit the growth of plants in locations which would otherwise be unsuitable. Naturally this device is recommended only for the home garden.

The question of varieties, although of great importance, is one which must be settled largely by individual growers; for the success of any variety will frequently depend on local conditions. It is always a good plan to have a trial ground for the newer sorts, as varieties of much promise at the Experiment Station may prove worthless in some localities.

In selecting varieties for planting it is well to bear in mind the distinction between the perfect flowering and the pistillate sorts. Many of our most valuable sorts are pistillate and must have some perfect flowering variety interspersed in order to secure the best results.

The following notes represent our estimate of the varieties fruited at the Experiment Station during the past two years:

Beeder Wood. (Perfect).—Small, spherical, uniform in size early in the season but soon "runs out." One of the earliest and most prolific sorts but of inferior quality. Plants quite subject to rust.

Beverly. (Perfect).—Large, oblong or spherical; of a rich dark color, moderately good quality, firm, prolific. A promising variety.

Bubach. (Pistillate).—Very large, irregular; of good color but poor quality, and lacking in firmness. Productive; valuable for near markets.

Charles Downing. (Perfect).—Of medium size, nearly spherical, moderately firm and of good quality. An old favorite for home use, but not as prolific as some others. Quite subject to rust.

Crawford. (Perfect).—Large, nearly spherical, uniform and regular; productive and of good flavor, but too soft and too light colored for market.

Crescent. (Pistillate).—An old and deservedly popular sort; but rather small and not of high quality.

Cumberland. (Perfect).—Plants vigorous and prolific; fruits large and of good quality, but too light colored and soft for market. One of the best for home use.

Dayton. (Perfect).—Medium to large, smooth and regular; of good quality but light colored and soft. Excellent for home use but too soft for market.

Epping. (Perfect).—Plants vigorous and prolific; fruit of medium size, roundish conical, uniform, bright red. A promising variety, received for trial from George Q. Dow, North Epping, N. H., under the name of "Yankee Doodle."

Gandy. (Perfect).—Of medium size, uniform, regular, firm and of good quality. Usually regarded as of special value as a late variety, but has not held its own with us.

Gen. Putnam. (Pistillate.)—Of medium size, but of pale color, soft and inferior in every way.

Gillespie. (Perfect).—Medium to large, oblong or conical, often with pronounced neck, firm, of good quality and color. One of the best sorts for general purposes.

Greenville. (Pistillate).—Medium to large, roundish conical, uniform, bright red, moderately firm and of good quality. Good for home and near market.

Haverland. (Pistillate).—Medium to large, oblong, regular, firm and of good quality. Plants strong and vigorous; free from rust. A very good sort for general purposes.

Jessie. (Perfect).—An early sweet berry of good size. Oblong or conical, bright glossy red, handsome and of good quality. It has been one of the most satisfactory with us but is not uniformly reliable.

Jewell. (Pistillate).—Of medium size and uniform; but soft and of light color. Not prolific.

Leader. (Perfect).—Medium size, roundish, bright red; fairly good quality. Only moderately productive.

Lovett. (Perfect).—Of the Crescent type. Early, prolific, but running small as the season advances and of second quality.

Michel's Early. (Perfect).—The earliest berry we have grown. Very productive, but small and of second quality. Blossoms very early and the flower trusses are short and well protected. Plants only moderately vigorous.

Mount Vernon. (Perfect).—Medium size, roundish conical, uniform. Of no special value.

Parker Earle. (Perfect).—Very productive, of large elongated fruit having a pronounced neck; firm and of good quality. The plants are very strong and vigorous, but send out few runners, hence should be planted thickly in the row. A valuable sort.

Princess. (Pistillate).—Plant strong, vigorous and productive; fruit a little dull in color, but large, nearly spherical, uniform, moderately firm and of good quality. Medium to late in season. One of the best general purpose sorts.

Sharpless. (Perfect).—Plants vigorous and prolific. Fruit large but somewhat irregular and not always ripening evenly. Of good quality and always reliable.

Smeltzer. (Smeltzer's Early). (Perfect).—Sent for trial by F. H. Smeltzer, Van Buren, Ark. Plants vigorous, healthy and productive. Fruit uniformly of medium size, oblong, firm, of dark rich color and good quality. A promising early variety.

Swindle. (Pistillate).—As grown on our grounds the variety is rightly named. Plants strong and vigorous but not productive. Fruit of medium size, light colored and of very poor quality.

Van Deman. (Perfect).—An early variety; small, spherical; of rich dark color and good quality, but soft and not productive.

Warfield. (Pistillate or with abortive stamens).—Moderately vigorous. Flowers small on short truss and well protected by foliage. Fruit of medium size, firm texture, moderately good quality; ripens evenly, holds its size through the season. Its deep rich color and productive habit make it one of the most valuable market sorts.

West Lawn. (Pistillate).—Sent for trial by C. P. Bauer & Bro., Judsonia, Ark. Plants very vigorous but not productive. Similar in general characteristics to "Cloud," which was sent out a few years ago.

The best of the older varieties above named are: Bubach, Crescent, Haverland, Sharpless and Warfield, with possibly Beeder Wood or Michel's as very early perfect flowering sorts.

Of the newer varieties the following deserve special mention: Beverly, Dayton, Epping, Gillespie, Greenville, Parker Earle, Princess, Smeltzer.

W. M. MUNSON.

MAINE STATE COLLEGE,
ORONO, ME., April 15, 1895.

BULLETIN No. 22.

INSPECTION OF FERTILIZERS.

W. H. JORDAN, Director.

J. M. BARTLETT, L. H. MERRILL, Chemists.

This bulletin is the second to be issued during the year 1895 giving a report of the official inspection of fertilizers. The first bulletin, No. 18, was published on March 9th, and gave the results of the analyses of Manufacturer's Samples. These samples were furnished by the manufacturers for inspection accompanied by an affidavit that they were like the goods which they represented "within reasonable limits."

The samples mentioned in this bulletin are almost wholly those selected by a Station representative at different points in the State from goods which were exposed or offered for sale. These samples were very carefully taken in accordance with the provisions of a law which seeks to guard the rights of the manufacturers, and they certainly represent the particular lots of goods from which they were selected.

The main purpose of selecting samples from the various brands of fertilizers as found in the open market is to ascertain if the goods actually on sale meet the requirements of the manufacturer's guarantees, and whether the manufacturer's samples, whose analyses are published in the Spring bulletin, are to any extent a safe guide in the purchase of fertilizers.

The comparison which follows shows very plainly what are the facts. It may be said that on the whole it appears that the manufacturers intend to deal fairly with the public in the matter of their guarantees, remembering always, of course, that no manufacturer can be held to have guaranteed more than the minimum percentage in which any ingredient is stated to be present.

Notwithstanding certain sarcastic, and we can but believe, unfriendly criticisms, because this Experiment Station decided to drop the system of commercial valuations, there is no present intention of receding from that decision. There are already indications that farmers who are disposed to put intelligence into their business will themselves, through the information furnished by the Station, make such calculations as are necessary for their choice of the brand which they can most economically purchase and will in that way understand the situation as they could in no other way; and it is obvious that to those farmers who are so careless or uninformed as not to do this, the valuations made by the Station are likely to be nothing but a stumbling block.

Any system of aiding the farmer which is merely mechanical and which leaves out of account a proper study on his part of the facts with which he has to deal is false in theory and less helpful in practice than it should be.

(The bulletin gave the manufacturers guarantees and the analyses of manufacturer's samples, but as these figures have only a passing value they are omitted here. The comments on the results of the inspection follow, however. W. H. J.)

A comparison is made of the samples selected by a Station representative, the manufacturer's samples and the minimum guarantees.

The important considerations are the following:

(1.) Fifty-seven brands are involved in this comparison.

(2.) The averages for nitrogen are: Guarantee, 1.99 per cent., manufacturer's sample, 2.14 per cent., Station sample, 2.09 per cent. For available phosphoric acid the averages are: Guarantee, 7.84 per cent., manufacturer's sample, 9.05 per cent., Station sample, 8.58 per cent. For potash: Guarantee, 3.31 per cent., manufacturer's sample, 3.60 per cent., Station sample, 3.42 per cent.

(3.) In the fifty-seven brands, the Station sample as compared with the manufacturer's sample was, in nitrogen practically the same twenty-three times, poorer twenty-two times and better twelve times; in available phosphoric acid, practically the same fourteen times, poorer thirty-one times and better twelve times; in potash, practically the same sixteen times, poorer twenty-four times and better seventeen times.

(4.) Comparing the *Station sample* with the *minimum guarantee*, the Station sample was, in nitrogen, practically the same twenty-seven times, poorer nine times, better twenty-one times; in available phosphoric acid, practically the same twenty times, poorer seven times, better thirty times; in potash, practically the same seventeen times, poorer fourteen times, and better twenty-six times.

It is quite customary for manufacturers to state a minimum and a maximum guarantee for the percentages of the ingredients of their goods, as for instance the guarantee for available phosphoric acid would be eight to ten per cent. The above comparisons indicate that the manufacturers do not intend to do much more than make good the minimum guarantee, and that this is all the purchaser can safely expect.

It is gratifying to note that as a rule the fertilizers sold in the State are well up to this guarantee. Indeed, there is no case which appears to be an attempt to defraud, although in a few instances the particular lots of goods sampled are not quite as good as they should be.

MAINE STATE COLLEGE,
Orono, Me., 1895.

FERTILIZER LAW IN FORCE IN MAINE.

PUBLIC LAWS OF MAINE, 1893.

CHAPTER 256.

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 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 follws: 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, 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 offence, and two hundred dollars for each subsequent offence.

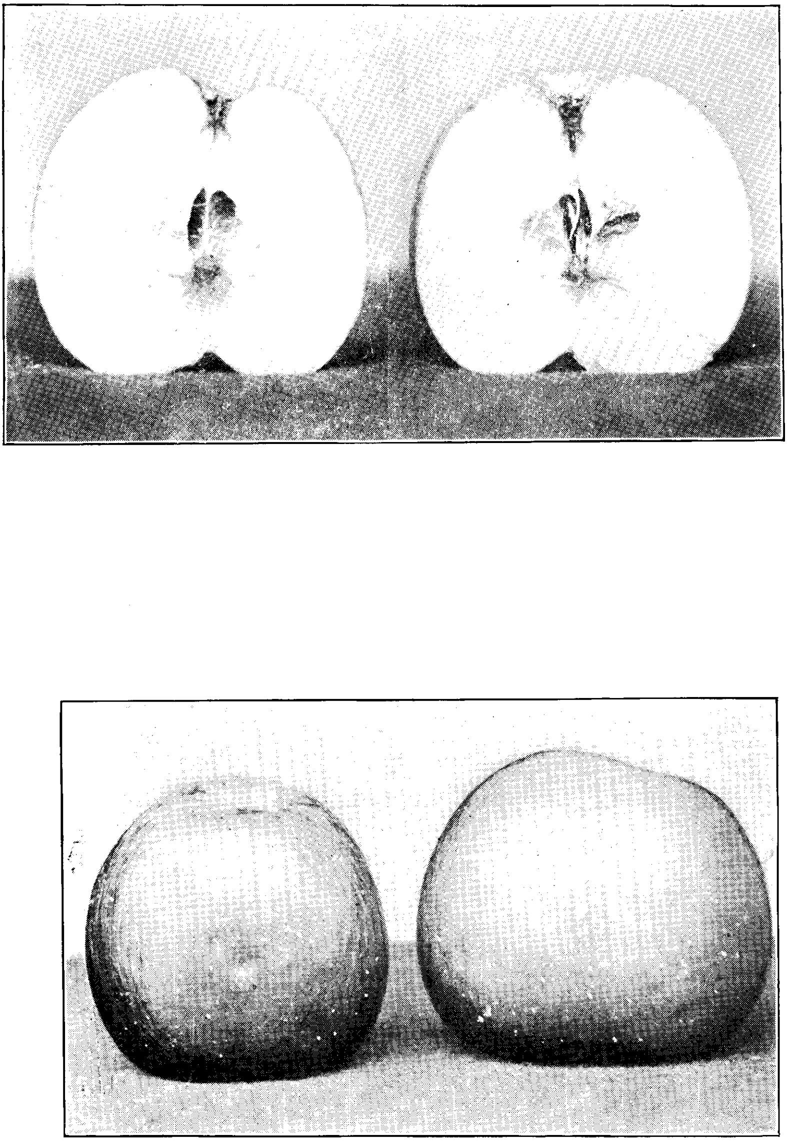
SECT. 6. The director of the Maine Experiment Station shall annually analyze, or caused to be analyzed, at least one sample, to be taken in the manner hereinafter presribed, of every fertilizer sold or offered for sale under the provisions of this act. Said director is hereby authorized and directed 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 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 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 March 14.



STOWE'S WINTER. See page 107-8.

APPENDIX.

Annual Report of the State Pomological Society.

1895-96.

FARMINGTON, June 1, 1896.

Hon. B. WALKER McKEEN,

Secretary Maine Board of Agriculture:

I have the honor to transmit herewith for publication in the annual report of the agriculture of Maine, the transactions of the Maine State Pomological Society for the year 1895-96.

Yours respectfully,

D. H. KNOWLTON, *Secretary.*

REPORT OF THE SECRETARY.

Herewith the Secretary submits his annual report. It is to a large degree formal, but during a year's work and a study of conditions and results there are matters that seem to commend it to the careful perusal of the fruit growers of Maine.

THE FRUIT CROP.

For the past ten or a dozen years there has been no general failure in the apple crop in Maine. Localities, for reasons as yet unknown, have had light crops, while others have had heavy crops. The 1895 crop was probably the smallest in all these years, and the failure was more general than in any other year during the time. The crop was very light, and worse than all, the quality was inferior. The cause of the short crop has been quite freely discussed, but no general conclusion seems to be reached. Among the causes noticed by the Secretary, a few may deserve a place in this report. Our leading varieties have borne fruit for several successive years, heavy crops in some cases. Except in rare instances the orchards have received no special attention in the way of dressing or care, and many of the trees suffering from the effects of the scab fungus in 1894 were unable to develop fruit buds for a crop in 1895. The orchards that received the best treatment bore the most fruit, but even this was inferior to the product of ordinary years. Some have claimed that it was the frost in the spring that caused the failure in the crop. This could not be the case, for as already stated, few if any fruit buds were developed the year before. This deserves special notice as it brings into prominence the fact that a spring frost rarely, if ever affects the apple blossoms in Maine. In this respect we have the most favorable climatic conditions for apple growing. The quality of the fruit was inferior in consequence of the scab, the codling worm and the trypeta pomonella. The results reached in spraying emphasize its importance, and it is not far away when successful fruit growers in the State will spray their trees to destroy the scab and codling worm. The spread of the trypeta is a cause of alarm among fruit growers, since no effective, practicable remedy is known. With its life history so well known it is hoped that our experiment station may be able to discover some effective means of holding the destructive pest in check.

The prices have been low, although choice lots have sold readily.

Of other fruits there was a small crop, although where not affected by the drouth there was a good crop of raspberries and blackberries. Pears being in full bloom at the time of the freeze suffered from the cold. This is especially true of several popular varieties. In some parts of the State the freeze destroyed the currant and gooseberry crop.

In this connection it is well to emphasize the importance of better culture and a more careful study of all the conditions that bear in any way upon this important industry. This would be preferable to the planting of more trees.

EXTENSION OF FRUIT CULTURE.

Many trees were set during the year, and although the quality is known to be inferior, I am satisfied that more of the Ben Davis have been selected than of any other variety. The high price this apple commands in the foreign market may be an apparent excuse for setting the trees, but it is very questionable, although the Ben Davis tree is a good grower and makes a good tree to top graft into some other variety.

Among the small fruits it is a great pleasure to observe the increased interest shown in their culture. People are learning fast that they may raise them readily and in abundance. No subject is listened to with closer attention at our meetings. Knowledge of methods of culture and varieties are eagerly sought. Best of all more people are enjoying this luxury, which is within the grasp of every man who controls a few feet of land.

PUBLIC MEETINGS

A public meeting was held in Deering April 11th, at which Prof. B. M. Watson, Jr., gave an instructive address upon "Hardy Trees and Shrubs."

The public meeting during the annual exhibition was addressed by Mrs. Alonzo Towle of Freedom, N. H. The attendance was large and the lecture was much enjoyed.

Desiring to extend the influence and usefulness of the society as far as possible to all parts of the State, it was thought best to accept the cordial invitation of Mr. John W. Dudley of Castle Hill and other citizens of Aroostook and hold the winter meeting in Presque Isle. Later it was arranged to make this a union meeting with the Board of Agriculture, and Secretary McKeen cordially joined with us to make the meeting one of the best. At this meeting special prominence was given to the culture of small fruits, and we were especially fortunate in securing the services of Mr. J. H. Hale of South Glastonbury, Conn. The papers and discussions awakened general interest in the subjects presented, and it is believed our efforts will prove of substantial benefit to that section of the State. The members of the society and other visitors were cordially received, and carried to their homes the pleasantest recollections of the people of Aroostook.

EXHIBITIONS

In view of the short fruit crop in the State, fears were entertained that the exhibition would be small. It was a great relief to the officers when the fruit came in to find the tables well filled. The winter fruits, of course, were immature, in consequence of the earliness of the exhibition and many of the specimens of other apples were wormy and more or less affected by scab fungus. The increasing injury caused by the trypeta pomonella was apparent to all, a larger number of varieties being affected than heretofore.

In the matter of making awards, the Executive Committee adopted a scale of points for use in judging such general exhibitions and special plates as might seem necessary to have the awards based upon the merit of the exhibits. In the general exhibition a table of ratings was prepared for each variety. These ratings constituted not exceeding one-half of the score for each variety. As the number of varieties exhibited in the various collections varied, the average score was made the basis of awarding the premiums. To illustrate, there were five collections and the figures were as follows:

First. Twenty varieties, 1,743 score, 667 rating, average 120.

Second. Forty varieties, 4,711 score, 1,163 rating, 117 average.

Third. Thirty-seven varieties, 3,121 score, 1,180 rating, 116 average.

Fourth. Thirty-one varieties, 2,597 score, 988 rating, 115 average.

Fifth. Thirty varieties, 2,429 score, 979 rating, 113 average.

The average shows how and why the premiums were awarded. At first some of the exhibitors felt that the awards had not been justly made, but in a careful review and examination of the fruit, the Executive Committee, as well as all disinterested observers recognized that the basis of making the awards was correct and that merit had been fully taken into account. It is possible that in some of its parts the plan may be imperfect, but the general idea is certainly correct, and some basis ought to be adopted by judges in order to do full justice to all exhibitors.

A BROAD FIELD.

The Secretary desires to express in this public form the thanks of the officers for the cordial co-operation and assistance rendered them by the press and by those interested in our work. When we realize how many people there are in the State who prefer to have their wives and daughters go out into the pastures and back lots to gather wild fruits and then not have half enough, there is abundance of educational work yet to be done. There is not a rural home in Maine that could not be made more attractive and healthful by the growing of fruits. Perhaps not all kinds could be grown, but some can. Again, there are many homes that have few, if any flowers, while nature has made it possible to raise many. Some of our towns and cities are made beautiful by parks and shade trees, but in all there are streets that are unadorned by nature and even their natural beauty is mutilated by the hand of man. So we might enumerate the opportunities that are open for the society. Its usefulness in the past has been somewhat circumscribed by its limited means, but the liberality of the State has opened the way for future progress by giving more liberally to promote the great industry we represent. Onward has been the watchword of the Society. The field is a broad one, and to the extent of every possible resource, it is the blessed privilege of the society to urge the more general culture of fruits and flowers and the adornment of our homes and public places.

Again, in behalf of the officers, I desire to thank all who have aided us in the work of the Society. All have treated us with the utmost courtesies and many have shown an active interest in our affairs. At the present time the Society has a permanent fund of $1,250, made up from the fees of 125 life members. It would seem in a State like ours that there should be a membership of at least a thousand. The income from a $10,000 permanent fund would insure the establishing of the most valuable helps to the fruit growers of Maine. The fund has been husbanded with the greatest solicitude for its safety. Now, let us roll it up to $10,000, remembering that the harvest cannot be large unless the sowing has been made with a liberal hand. A general effort to secure this grand result will bring us a liberal reward. Let each one lend a hand in the great work.

D. H. KNOWLTON, *Secretary*.

FARMINGTON, 1895.

OFFICERS FOR 1896.

President.

JOHN W. TRUE, New Gloucester.

Vice Presidents.

S. H. DAWES, Harrison.

D. P. TRUE, Leeds Center.

Secretary.

D. H. KNOWLTON, Farmington.

Treasurer.

CHARLES E. WHEELER, Chesterville.

Executive Committee.

The President and Secretary, *ex-officio*; A. E. Andrews, Gardiner; Z. A. Gilbert, North Greene; C. H. George, Hebron.

Trustees.

Androscoggin	County,	C. M. Skillings, West Auburn.
Aroostook	"	J. W. Dudley, Castle Hill.
Cumberland	"	W. G. Bailey, Freeport.
Franklin	"	Herman Corbett, Farmington.
Hancock	"	C. G. Atkins, Bucksport.
Kennebec	"	E. A. Lapham, Pittston.
Knox	"	Alonzo Butler, Union.
Lincoln	"	H. J. A. Simmons, Waldoboro'.
Oxford	"	S. M. King, South Paris.
Penobscot	"	F. L. Harvey, Orono.
Piscataquis	"	H. L. Leland, East Sangerville.
Sagadahoc	"	A. P. Ring, Richmond Corner.
Somerset	"	James S. Hoxie, North Fairfield.
Waldo	"	Fred Atwood, Winterport.
Washington	"	J. F. Sprague, Charlotte.
York	"	John Hanscom, Saco.

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
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
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
Gurney, Lemuel .... Hebron
Hackett, E. C .... West Gloucester
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 H.... 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
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, 1895.

Archer, Mrs. George F..............Clifton
Bartlett, B. W ....East Dixmont
Blanchard, Mrs. E. M ....Lewiston
Chandler, Lucy A ....Freeport
Crooker, W. W ....Monson
Dudley, John W..............Castle Hill
Eastman, A. A.......................Dexter
Grover, Mrs. F. D ....Bean's Corner
Hathaway, W. S ....East Auburn
Judkins, Charles H......... Chesterville
King, S. M ....South Paris
Larrabee, O. L..............West Levant
Leland, H. L............East Sangerville
Lemont, J. M. .... Bath
Merritt, Frank C .... Houlton
Munson, W. M ....Orono
Norris, J. F..........................Foxcroft
Nowell, F. E.............................Fairfield
Ridley, B. H ....Jay
Ring, Abbe E.........Richmond Corner
Ring, A. P............. Richmond Corner
Sleeper, F. L. H..................Lewiston
Tarr, Edward........................ Castle Hill
Waterman, Mrs. C. E...... East Auburn
Wright, L. E.... .... Woolwich

ANNUAL MEMBERS, 1896.

Dudley, A. M.......................Mapleton
Eastman, A. A......................Dexter
Emery, Edward H................Sanford
Hayford, Columbus ....Maysville
Sturgis, C. G..........................Auburn
Tarr, Edward.....................Castle Hill
Whittier, Phineas .....Farmington Falls

TREASURER'S REPORT.

RECEIPTS.

Cash on loan		$ 100 00
Cash from State on deficiency account		1,000 00
Cash from State stipend for 1895		1,000 00
Interest:		
Gardiner National Bank	$12 00	
Farmington Water Company	7 00	
Deposit	2 00	
		21 00
Annual members:		
W. M. Munson, Orono	$1 00	
J. F. Norris, Foxcroft	1 00	
W. W. Crooker, Monson	1 00	
Chas. H. Judkins, Chesterville	1 00	
O. L. Larrabee, West Levant	1 00	
H. L. Leland, East Sangerville	1 00	
B. H. Ridley, Jay	1 00	
S. M. King, South Paris	1 00	
Edward Tarr, Castle Hill	1 00	
John W. Dudley, Castle Hill	1 00	
Mrs. C. E. Waterman, East Auburn	1 00	
Mrs. E. M. Blanchard, Lewiston	1 00	
Mrs. F. D. Grover, Bean's Corner	1 00	
A. P. Ring, Richmond Corner	1 00	
Mrs. Geo. F. Archer, Clifton	1 00	
F. L. H. Sleeper, Lewiston	1 00	
F. E. Nowell, Fairfield	1 00	
A. A. Eastman, Dexter	1 00	
J. M. Lemont, Bath	1 00	
L. E. Wright, Woolwich	1 00	
B. W. Bartlett, East Dixmont	1 00	
W. S. Hathaway, East Auburn	1 00	
Frank C. Merritt, Houlton	1 00	
Abbie E. Ring, Richmond Corner	1 00	
Lucy A. Chandler, Freeport	1 00	
Edward Tarr, Castle Hill—for 1896	1 00	
C. G. Sturgis, Auburn—for 1896	1 00	
		27 00
Life members:		
Edward H. Prince, West Farmington	10 00	
Chas. S. Keene, Turner	10 00	
Geo. E. Bisbee, Auburn	10 00	
J. H. Litchfield, Auburn	10 00	
O. L. Larrabee, West Levant	10 00	
B. H. Ridley, Jay	10 00	
Mrs. Anthony Cummings, Auburn	10 00	
		70 00
Maine State Agricultural Society		500 00
Cash on hand December 31, 1894		193 65
		$2,911 65

EXPENDITURES.

D. H. Knowlton, Secretary, expenses at winter meeting		$28 62
C. E. Wheeler, Treasurer, expenses and services as treasurer, 1894		32 90
W. M. Munson, Executive Committee, expenses		19 76
Chas. S. Pope, President, expenses, 1894		14 95
A. E. Andrews, Executive Committee, expenses		18 25
J. W. True, Executive Committee, expenses		18 80
Remitted to life members		3 00
Notes paid		700 00
Interest on notes		12 58
B. M. Watson, Deering lecture		10 00
D. H. Knowlton, Secretary, salary, 1894		125 00
D. H. Knowlton, Secretary, salary, 1895		150 00
D. H. Knowlton, Secretary, expenses		22 36
Frank Jones, Deering, hall		6 00
Legal services, A. M. Spear		25 00
A. E. Andrews, Executive Committee, expenses		3 30
Chas. E. Wheeler, Treasurer, expenses		27 30
W. M. Munson, Executive Committee, expenses		9 84
Miss Olive C. Adams, report of Deering meeting		5 50
C. S. Goddard, plants for children		20 00
Knowlton, McLeary & Co., engravings for Transactions		8 75
Mrs. Alonzo Towle, services as judge at State Fair		25 00
A. W. Pottle, exhibition phials		4 80
D. H. Knowlton, Secretary, expenses		18 00
D. H. Knowlton, Secretary, expenses		25 39
R. C. Pingree & Co., flower stands		20 00
Miss G. P. Sanborn, labor at Fair		8 00
Warren Fenno, judge on fruit		28 50
John Milliken, labor at Fair		10 00
Clerks at Fair		18 00
Miss Callahan, Elocutionist, Fair meeting		5 00
O. E. Stanley, services at exhibition		3 75
Dover Stamping Company, exhibition plates		18 00
A. E. Andrews, Executive Committee, expenses		9 55
Chas. E. Wheeler, Treasurer, expenses		16 80
A. E. Andrews, Executive Committee, expenses		25 85
C. H. George, Executive Committee, expenses		14 30
John W. True, President, expense		13 95
Burleigh & Flynt, printing		3 00
N. Dingley, Jr., & Co., printing		9 00
Knowlton, McLeary & Co., printing		34 47
D. H. Knowlton, Secretary, expense		4 95
John W. True, President, expenses		1 25
C. H. George, Executive Committee, expenses		2 50
A. E. Andrews, Executive Committee, expenses		3 40
Chas. E. Wheeler, Treasurer, services and postage		21 25
Deposited in Wiscasset Savings Bank, Permanent Fund		100 00
Deposited in Augusta Safe Deposit and Trust Company		200 00
Permanent Fund, Chas. E. Wheeler, Treasurer:		
Premiums at Winter Meeting	48 00	
at State Fair	821 85	
		869 85
Cash in treasury December 31, 1895		135 18
		$2,911 65

FINANCIAL CONDITION OF THE SOCIETY DECEMBER 31, 1895, SO FAR AS KNOWN TO THE TREASURER.

Assets.

Bounty due from State	$1,000 00
Property owned by society	250 00
Permanent fund	1,021 31
Interest due (estimated)	10 00
Cash in treasury	135 18
	$2,416 49

Liabilities.

Outstanding bills and accounts	$ 50 00
Due permanent fund	228 69
	$278 69

PERMANENT FUND.

Dr.

Deposit in Wiscasset Savings Bank	$121 31
First National Bank, Farmington	400 00
Merchants' National Bank, Gardiner	200 00
Farmington Water Company	100 00
Augusta Safe Deposit and Trust Company	200 00
Balance due fund	228 69
	$1,250 00

Cr.

By 118 life members to January 1, 1895	$1,180 00
By 7 life members received in 1895:	
George E. Bisbee, Auburn	10 00
Mrs. Anthony Cummings, Auburn	10 00
Charles S. Keene, Turner	10 00
J. H. Litchfield, Auburn	10 00
O. L. Larrabee, West Levant	10 00
Edward H. Prince, West Farmington	10 00
B. H. Ridley, Jay	10 00
	$1,250 00

CHARLES E. WHEELER, Treasurer.

Chesterville, December 31, 1895.

BUSINESS TRANSACTIONS.

ANNUAL MEETING.

September 6th. Met in accordance with the following call—"Annual Meeting—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 Exhibition Building in the Park, Lewiston, Thursday evening at 6.30 P. M.

Proceeded to the election of officers for the year 1896. [See page 7.]

WINTER MEETING.

In accord with arrangements entered into with the Secretary of the State Board of Agriculture and by invitation of Mr. John W. Dudley in behalf of the citizens of Aroostook, the meeting was held in Academy Hall, Presque Isle, January 8 and 9, 1896.

The meeting was called to order by President True at the appointed hour, and the Treasurer and Secretary presented their annual reports. [See preceding pages.]

On motion of the Secretary, committees were appointed by the President as follows:

On Exhibition of Fruits Listed—A. E. Andrews, Edward Tarr and Ezra McGlauflin.

On Aroostook Seedlings—Charles S. Pope, C. H. George and J. W. Dudley.

On Resolutions—B. W. McKeen, W. H. Vinton and F. L. Harvey.

On recommendation of Professor Harvey it was

Voted, That a committee on cranberries be appointed by the Society to look up cranberry culture for Maine in all of its phases, as to the feasibility and desirability of extending the culture in the State, the committee to report to the Society at some future meeting. The following committee was then appointed: F. L. Harvey, D. H. Knowlton, and W. M. Munson.

The reports of the committees on an exhibition of fruits were read by the Secretary. [See schedule of awards.]

Secretary McKeen, in behalf of the committee on resolutions, reported, expressing thanks to the people of Aroostook for their courtesies, and to the hotel and railroads for reduced rates. The report was adopted.

Mr. McKeen of the Board of Agriculture, expressed his pleasure at the excellence of the meeting and the interest shown by the people of Aroostook. He thanked them for the courtesies shown the visitors, and expressed the hope that great good might result from the meeting.

MEETINGS OF EXECUTIVE COMMITTEE.

April 11, 1895. Met at Preble House, Portland.

Voted, To adopt a scale of points for collective exhibitions of apples, pears and plums.

The schedule of premiums was revised for the next annual exhibition.

Voted, To instruct President True to procure four hundred exhibition plates.

Voted, To purchase one or more gross of phials for the cut flower exhibition.

Voted, That the Treasurer be instructed to draw all money due from State and deposit same in some bank.

Adjourned to attend a meeting at Deering, which was addressed by Prof. B. M. Watson, Jr., of the Bussey Institution of Harvard University. (A condensed stenographic report of this address appears among the Papers, Discussions, &c.)

August 6th. Met at Elm House, Auburn.

Prof. Munson's absence abroad was noted and the Secretary and President were requested to fill the vacancy.

Voted, That the Secretary employ experts for the fair.

Voted, That President True be requested to meet with the trustees of the State Agricultural Society and confer with them in regard to certain changes in the exhibition room. Visited the buildings and so far as possible arranged for exhibition.

September 6th. Meeting held in Lewiston.

Voted, To refer the time and place of holding the annual meeting to the President and Secretary.

Voted, To request the treasurer to give a bond for two thousand dollars, subject to the approval of the President and Secretary.

Voted, To instruct the President and Treasurer to invest sufficient money to make good the permanent fund to date.

October 30th. Meeting held in Elm House, Auburn. The Secretary presented the schedule of premiums awarded at the Annual Exhibition, amounting to $821.85, and the Treasurer was authorized and instructed to pay the same.

Voted, To hold our next Winter Meeting in Aroostook county at such point as may be determined by the President and Secretary. Dates also referred to them.

The President and Secretary were instructed to prepare and issue premium list for Winter Meeting. Express on fruit to be paid by the Society. They were also instructed to prepare a programme for the Winter Meeting, in conference with the Secretary of the Board of Agriculture.

January 8, 1896. Met in the Presque Isle House. Treasurer's account was examined and approved.

Voted, To arrange with the State Treasurer or some reliable bank or deposit company in Augusta to hold in trust the securities representing our permanent fund, for the protection and safety of the Society.

Voted, To instruct Messrs. Andrews and Knowlton to carry into effect the vote of committee regarding the permanent fund, and that the receipt for the same be forwarded to the Treasurer as voucher for the same.

The following day Messrs. Andrews and Knowlton visited Augusta and deposited the papers and securities belonging to the permanent fund with the Augusta Safe Deposit and Trust Company, "subject to demand on order of Executive Committee."

PREMIUMS AWARDED.

Annual Exhibition Held in Lewiston, September 2, 3, 4, 5 and 6, 1895.

APPLES.

Best general exhibition of apples: O. L. Larrabee, West Levant, first, $20; S. H. Dawes, Harrison, second, $15; third, B. H. Ridley, Jay, $10.

Best exhibition of apples grown in Androscoggin county: First, A. S. Ricker, Turner, $10; second, John Wallingford, West Auburn, $8; third, D. P. True, Leeds Center, $5.

Same in Aroostook county: First, J. W. Dudley, Mapleton, $10; second, Edward Tarr, Castle Hill, $8.

Same in Cumberland county: First, S. H. Dawes, $10; second, John W. True, New Gloucester, $8.

Same in Franklin county: First, G. K. Staples, Temple, $10; second, E. F. Purington, West Farmington; third, M. C. Hobbs, West Farmington, $5.

Same in Kennebec county: First, E. A. Lapham, Pittston, $10; second, Wm. R. Wharff, Gardiner, $8; third, Charles S. Pope, Manchester, $5.

Same in Knox county: First, Alonzo Butler, Union, $10; second, I. B. Tolman, Union, $8; third, Willis A. Luce, South Union, $5.

Same in Oxford county: First, C. H. George, Hebron, $10; second, Lemuel Gurney, Hebron, $8.

Same in Penobscot county: First, C. A. Arnold, Arnold, $10; second, L. P. Toothaker, Simpson's Corner, $8; third, J. P. Kenniston, Simpson's Corner, $5.

Same in Sagadahoc county: First, A. P. Ring, Richmond Corner, $10; second, J. M. Lamont, Bath, $8; third, L. E. Wright, Woolwich, $5.

Same in Somerset county: First, F. E. Nowell, Fairfield, $10; second, J. S. Hoxie, North Fairfield, $8.

Same in Waldo county: First, Mrs. A. B. Strattard, Monroe, $10; second, B. W. Bartlett, East Dixmont, $8.

Exhibition of new fruits originated by Peter M. Gideon, gratuity; E. F. Purington, $2.

Baldwins: First, S. H. Dawes, $5; second, C. A. Arnold, $3; third, O. L. Larrabee, $2.

Gravenstein: First, C. S. Pope, $3; second, John Wallingford, $2; third, A. S. Ricker, $1.

Hubbardston Nonsuch: first, S. H. Dawes, $3; second, D. J. Briggs, South Turner, $2; third, B. H. Ridley, $1.

Northern Spy: First, W. S. Hathaway, East Auburn, $3; second, W. A. Luce, $2; third, S. H. Dawes, $1.

Rhode Island Greening: First, B. H. Ridley, $5; second, Lemuel Gurney, $3; third, O. L. Larrabee, $2.

Roxbury Russets: First, D. J. Briggs, $3; second, Alonzo Butler, $2; third, R. H. Gardiner, $1.

Tompkins King: First, S. H. Dawes, $3; second, F. E. Nowell, $2; third, O. L. Larrabee, $1.

Yellow Bellflower: First, R. H. Gardiner, Gardiner, $3; second, C. A. Arnold, $2; third, W. R. Wharff, $1.

Alexander: First, F. E. Nowell, $1; second, D. S. Thomas, North Auburn, 50c.

Golden Russet: First, G. K. Staples, $1; second, Lemuel Gurney, 50c.

Ben Davis: First, H. E. Fairbanks, North Monmouth, $1; second, Lemuel Gurney, 50c.

Deane: First, G. K. Staples, $1; second, Chas. S. Pope, 50c.

Duchess of Oldenburg: First, A. A. Eastman, Dexter, $1; second, Chas. S. Pope, 50c.

Fallawater: First, A. A. Eastman, $1; second, C. I. Perley, Cross Hill, 50c.

Fall Harvey: First, D. J. Briggs, $1; second, B. H. Ridley, 50c.

Fameuse: First, C. I. Perley, $1; second, C. A. Arnold, 50c.

Garden Royal: First, C. I. Perley, $1; second, D. C. Averill, Temple, 50c.

Granite Beauty: First, C. I. Perley, $1; second, D. J. Briggs, 50c.

Jewett's Fine Red: First, Wm. R. Wharff, $1; second, S. H. Dawes, 50c.

King Sweeting: First, C. I. Perley, $1; second, O. L. Larrabee, 50c.

Large Yellow Bough: First, Alonzo Butler, $1; second, F. E. Nowell, 50c.

McIntosh Red: First, C. I. Perley, $1; second, J. W. Dudley, 50c.

Milding: Second, O. L. Larrabee, $1.

Mother: First, Chas. S. Pope, $1; second, R. H. Gardiner, 50c.

Munson Sweet: First, B. H. Ridley, $1; second, E. F. Purington, 50c.

Peck's Pleasant: First, R. H. Gardiner, $1; second, J. S. Hoxie, 50c.

Pomme Royal: First, C. S. Pope, $1; second, C. H. George, 50c.

Porter: First, S. H. Dawes, $1; second, E. A. Lapham, 50c.

Pound Sweet: First, S. H. Dawes, $1; second, Alonzo Butler, 50c.

Primate: Second, S. H. Dawes, 50c.

Red Astrachan: First, Alonzo Butler, $1; second, C. H. George, 50c.

Rolfe: First, F. E. Nowell, $1; second, O. L. Larrabee, 50c.

Russell: Second, B. H. Ridley, 50c.

Somerset: First, B. H. Ridley, $1; second, F. E. Nowell, 50c.
Stark: First, A. A. Eastman, $1; second, D. S. Thomas, 50c.
Starkey: First, F. E. Nowell, $1; second, Chas. S. Pope, 50c.
Talman: First, Chas. S. Pope, $1; second, F. E. Nowell, 50c.
Twenty Ounce: First, S. H. Dawes, $1; second, R. H. Gardiner, 50c.
Wagener: First, D. S. Thomas, $1; second, F. E. Nowell, 50c.
Wealthy: First, J. W. True, $1; second, A. A. Eastman, 50c.
Williams' Favorite: First, L. Morrison, West Farmington, $1; second, O. L. Larrabee, 50c.
Winthrop Greening: First, Wm. R. Wharff, $1; second, E. A. Lapham, 50c.
Yellow Transparent: Second, F. E. Nowell, 50c.
American Golden Russet: First, W. A. Luce, 50c.
Autumn Strawberry: First, John Wallingford, 50c; second, Alonzo Butler, 25c.
Beauty of Kent: First, O. L. Larrabee, 50c.; second, C. A. Arnold, 25c.
Bailey Sweet: First, S. H. Dawes, 50c.
Bloomfield: First, S. H. Dawes, 50c.
Black Oxford: First, E. A. Lapham, 50c.
Blue Pearmain: First, R. H. Gardiner, 50c.; second, S. H. Dawes, 25c.
Colvert: First, Alonzo Butler, 50c.; second, F. E. Nowell, 25c.
Cooper's Market: First, F. E. Nowell, 50c.; second, Alonzo Butler, 25c.
Early Harvest: First, W. A. Luce, 50c.; second, B. H. Ridley, 25c.
Fall Jenneting: First, Alonzo Butler, 50c.; second, S. H. Dawes, 25c.
Fall Pippin: First, S. H. Dawes, 50c.
Grimes' Golden: First, E. A. Lapham, 50c.; second, S. H. Dawes, 25c.
Gloria Mundi: First, B. H. Ridley, 50c.; second, E. A. Lapham, 25c.
Golden Ball: First, C. A. Arnold, 50c; second, M. C. Hobbs, 25c.
General Grant Crab: First, C. A. Arnold, 50c.
Hightop Sweet: First, O. L. Larrabee, 50c.; second, F. E. Nowell, 25c.
Hoyt Sweet: First, C. S. Pope, 50c.
Hurlbut: First, W. A. Luce, 50c.; second, Alonzo Butler, 25c.
Haas: First, C. A. Arnold, 50c.
Holden Pippin: First, Alonzo Butler, 50c.
Hyslop Crab: First, Alonzo Butler, 50c.; second, C. A. Arnold, 25c.
Kilham Hill: First, A. S. Ricker, 50c.; second, F. H. L. Sleeper, 25c.
Ladies' Sweet: First, C. H. George, 50c.
Lyscom: First, W. A. Luce, 50c.; second, C. A. Arnold, 25c.
Mann: First, A. A. Eastman, 50c.
Montreal Peach: First, S. H. Dawes, 50c; second, J. W. True, 25c.
McClellan: First, B. H. Ridley, 50c.
Mammoth: First, F. H. L. Sleeper, 50c; second, B. H. Ridley, 25c.
Maiden's Blush: First, F. E. Nowell, 50c; second, C. A. Arnold, 25c.
Minister: First, Alonzo Butler, 50c; second, A. S. Ricker, 25c.
Newtown Pippin: First, S. H. Dawes, 50c.

New England Beauty: First, C. H. George, 50c.
Orange Spec: First, C. H. George, 50c.
Orange Sweet: First, Alonzo Butler, 50c; second, C. A. Arnold, 25c.
Pumpkin Sweet: First, O. L. Larrabee, 50c.; second, S. H. Dawes, 25c.
Pewaukee: First, C. A. Arnold, 50c.; second, E. A. Lapham, 25c.
President: First, F. E. Nowell, 50c.; second, A. S. Ricker, 25c.
Pennoch Red Winter: First, W. A. Luce, 50c.
Rome Beauty: First, S. H. Dawes, 50c.; second, C. H. George, 25c.
River: First, F. E. Nowell, 50c.; second, C. H. George, 25c.
Rubicon: Second, D. S. Thomas, 25c.
Ribston Pippin: First, A. S. Ricker, 50c.; second, E. A. Lapham, 25c.
Rambo: First, D. P. True, 50c.; second, Alonzo Butler, 25c.
Spitzenberg: First, John Wallingford, 50c.; second, S. H. Dawes, 25c.
St. Lawrence: First, Lemuel Gurney, 50c.; second, F. E. Nowell, 25c.
Sweet Baldwin: First, B. H. Ridley; second, D. P. True, 25c.
Sops of Wine: First, F. E. Nowell, 50c.; second, S. H. Dawes, 25c.
Scott's Winter: First, G. W. Whitney, West Newburg, 50c.; second, M. C. Hobbs, 25c.
Swaar: First, D. P. True, 50c.
Transcendent Crab: First, C. A. Arnold, 50c.; second, John Wallingford, 25c.
Whitney's Red: First, S. H. Dawes, 50c.
Wallbridge: First, C. I. Perley, 50c.; second, J. W. True, 25c.

PEARS.

General exhibition of pears: First, S. H. Dawes, $10; second, C. I. Perley, $8; third, D. P. True, $5.
Clapp's Favorite: First, A. S. Ricker, $3; second, S. H. Dawes, $2.
Bartlett: First, S. H. Dawes, $3; second, A. S. Ricker, $2.
Sheldon: First, A. S. Ricker, $3; second, B. H. Ridley, $2.
Belle Lucrative: First, C. I. Perley, $1; second, Alonzo Butler, 50c.
Beurre d'Anjou: First, C. I. Perley, $1; second, D. P. True, 50c.
Beurre Bosc: First, John W. True, $1.
Beurre Superfin: First, D. P. True, $1.
Beurre Clairgeau: First, D. J. Briggs, $1; second, O. L. Larrabee, 50c.
Beurre Diel: First, D. J. Briggs, $1; second, C. I. Perley, 50c.
Buffum: First, D. P. True, $1; second, S. H. Dawes, 50c.
Doyenne Boussock: First, S. H. Dawes, $1; second, C. I. Perley, 50c.
Duchesse d'Angouleme: First, S. H. Dawes, $1; second, C. I. Perley, 50c.
Goodale: First, C. I. Perley, $1.00; second, S. H. Dawes, 50c.
Howell: First, S. H. Dawes, $1; second, J. S. Hoxie, 50c.
Louise Bonne de Jersey: First, S. H. Dawes, $1; second, O. L. Larrabee, 50c.
Seckel: First, A. S. Ricker, $1; second, D. J. Briggs, 50c.
Souvenir du Congress: First, S. H. Dawes, $1; second, C. H. George, 50c.

Lawrence: First, Lemuel Gurney, $1; second, S. H. Dawes, 50c.
Flemish Beauty: First, S. H. Dawes, 50c.; second, B. H. Ridley, 25c.
Beurre Gifford: First, C. S. Pope, 50c.
Eastern Belle: First, J. S. Hoxie, 50c.
Keiffer: Second, S. H. Dawes, 25c.
Keiffer Hybred: Second, D. P. True, 25c.
Dearborn Seedling: First, S. H. Dawes, 50c.
Vicar of Wakefield: First, S. H. Dawes, 50c.
Rostiezer: First, S. H. Dawes, 50c.
Rutter: First, S. H. Dawes, 50c.
Tyson: First, D. P. True, 50c; second, S. H. Dawes, 25c.
Dana's Honey; First, S. H. Dawes, 50c.
Brandywine: First, D. P. True, 50c.
Glout Morceau: First, C. I. Perley, 50c.

PLUMS.

General exhibition of Plums: First, W. A. Luce, $6; second, S. H. Dawes, $4.
Bavay's Green Gage: First, W. A. Luce, $1.
Bradshaw: First, W. A. Luce, $1; second, B. T. Townsend, 50c.
Green Gage: First, B. T. Townsend, $1.
Purple Gage: First, B. T. Townsend, Freeport, $1.
Red Gage: First, F. E. Nowell, $1.
General Hand: First, Lemuel Gurney, $1.
Japan Plums—Burbank: First, Chas. Miller, East Union, $1.
Jefferson: First, John W. True, $1.
Lawrence: First, S. H. Dawes, $1.
Lombard: First, Lemuel Gurney, $1; second, C. H. George, 50c.
McLaughlin: First, W. A. Luce, $1.
Moores Arctic: First, S. H. Dawes, $1; second, W. A. Luce. 50c.
Quackenbos: First, W. A. Luce, $1.
Yellow Egg: First, W. A. Luce, $1; second, S. H. Dawes, 50c.

SMALL FRUITS IN GLASS IN PRESERVING FLUID.

Strawberries: First, A. A. Eastman, 50c.
Currants: First, A. A. Eastman, 50c.
Gooseberries: First, A. A. Eastman, 50c.
Raspberries: First, A. A. Eastman, 50c.
Burbank Plums: First, A. A. Eastman, 50c.

MISCELLANEOUS.

Peaches: First, S. H. Dawes, $1; second, D. J. Briggs, 50c.

Blackberries: Gratuity, Alonzo Butler, 50c.

Quince: First, D. P. True, $1; second, S. H. Dawes, 50c.

Collection of Grapes: First, S. H. Dawes, $3.

Collection of Canned Fruit, Preserves, etc.: First, Mrs. F. D. Grover, Bean's Corner, $8; second, Mrs. A. A. Eastman, Dexter, $5; gratuity, Mrs. Annie S. Corbett, Farmington, $3; gratuity, Mrs. Francis Hoyt, Winthrop, $2.

Canned Blackberries: First, Miss Abbie E. Ring, Richmond Corner, 50c; second, Mrs. Francis Hoyt, 25c.

Canned Blueberries: First, Mrs. Annie S. Corbett, 50c; second, Mrs. F. Hoyt, 25c.

Canned Cherries: First, Mrs. F. D. Grover, 50c; second, Mrs. F. Hoyt, 25c.

Canned Gooseberries: Second, Mrs. F. Hoyt, 25c.

Canned Pears: First, Mrs. F. D. Grover, 50c; second, Mrs. Annie S. Corbett, 25c.

Canned Plums: First, Mrs. F. Hoyt, 50c.

Canned Raspberries: First, Mrs. F. D. Grover, 50c. second, Miss Abbie E. Ring, 25c.

Canned Strawberries: First, Mrs. F. Hoyt, 50c.; second, Mrs. F. D. Grover, 25c.

Canned Tomatoes: First, A. A. Eastman, 50c.; second, Mrs. F. Hoyt, 25c.

Preserved Apples: First, Mrs. C. A. Arnold, Arnold, 50c.; second, Mrs. F. D. Grover, 25c.

Preserved Currants: First, Mrs. F. Hoyt, 50c.; second, Mrs. A. A. Eastman, 25c.

Preserved Cherries: First, Mrs. C. A. Arnold, 50c.; second, Mrs. Francis Hoyt, 25c.

Preserved Pears: First, Mrs. F. D. Grover, 50c.; second, Mrs. Annie S. Corbett, 25c.

Preserved Plums: First, Mrs. Annie S. Corbett, 50c.; second, Mrs. C. A. Arnold, 25c.

Preserved Raspberries: First, Mrs. F. D. Grover, 50c.; second, Miss Abbie E. Ring, 25c.

Preserved Strawberries: First, Miss Abbie E. Ring, 50c.; second, Mrs. Francis Hoyt, 25c.

Assorted Pickles: First, Mrs. F. D. Grover, 50c.; second, Mrs. F. Hoyt, 25c.

Tomato Catsup: First, Mrs. F. Hoyt, 50c.

Collection of Apple Jellies: First, Mrs. F. D. Grover, $3; second, Mrs. Annie S. Corbett, $2.

Apple Jelly: First, Mrs. Annie S. Corbett, $1; second, Mrs. F. Hoyt, 50c.

Crab Apple Jelly: First, Mrs. F. D. Grover, 50c.; second, Mrs. Annie S. Corbett, 25c.

Currant Jelly: First, Mrs. F. D. Grover, 50c.; second, Mrs. F. Hoyt, 25c.

Grape Jelly: First, Mrs. F. D. Grover, 50c.; second, Mrs. Annie S. Corbett, 25c.

Raspberry Jelly: First, Mrs. F. D. Grover, 50c.; second, Mrs. Annie S. Corbett, 25c.

Rhubarb Jelly: Second, Mrs. Francis Hoyt, 25c.

Strawberry Jelly: First, Mrs. F. D. Grover, 50c.; second, Mrs. Annie S. Corbett, 25c.

Maple Syrup: First, C. H. George, 50c.; second, Lemuel Gurney, 25c.

Maple Sugar: First, Lemuel Gurney, 50c.

Evaporated Apples: First, Lemuel Gurney, 25c.

FLOWERS.

Display Cut Flowers grown by Florist: First, Miss G. P. Sanborn, Augusta, $10; second, Lucy A. Chandler, Fryeburg, $8; third, C. S. Goddard, Woodford's, $5.

Display Cut Flowers: First, Mrs. Chas. Stanley, Winthrop, $10; second, Mrs. B. T. Townsend, Freeport, $8; third, Mrs. A. B. Strattard, $5.

Roses: First, Miss G. P. Sanborn, $5.

Dahlias: First, Mrs. Chas. Stanley, $2; second, Mrs. George F. Archer, Clifton, $1.

Chinese Pinks: First, Mrs. B. T. Townsend, $2; second, Mrs. Chas. Stanley, $1.

Carnations: First, Lucy A. Chandler, $2.

Lilies: Second, Mrs. Geo. F. Archer, $1.

Asters: First, Mrs. Charles Stanley, $1; second, Mrs. George F. Archer, 50c.

Pansies (named): First, Mrs. A. B. Strattard, $2.

Pansies: First, Mrs. Annie S. Corbett, $1; second, Francis Hoyt, 50c.

Zinnias: First, Mrs. Francis Hoyt, $1; second, Mrs. Chas. Stanley, 50c.

Phlox Drummondii: First, Mrs. B. T. Townsend, $1; second, Mrs. Chas. Stanley, 50c.

Perennial Phlox: Second, Lucy A. Chandler, $1.

Stocks: First, Mrs. Geo. F. Archer, $1; second, Mrs. Chas. Stanley, 50c.

Sweet Peas: First, Mrs. F. Hoyt, $1; second, Mrs. Annie S. Corbett, 50c.

Balsams: First, Mrs. Geo. F. Archer, $1; second, Mrs. F. Hoyt, 50c.

Petunias: First, Mrs. Chas. Stanley, $1; second, Mrs. Geo. F. Archer, 50c.

Gladioli: First, Mrs. George F. Archer, $2; second, Lucy A. Chandler, $1.

Verbenas: First, Mrs. E. M. Blanchard, Lewiston, $1; second, Mrs. B. T. Townsend, 50c.

Vase of Cut Flowers: First, Mrs. A. S. Corbett, $3; second, Mrs. Anthony Cummings, Auburn, $2; third, Mrs. D. H. Knowlton, Farmington, $1.

Six Button-hole Bouquets: First, C. S. Goddard.

Floral Design (professional): First, C. S. Goddard, $8; second, Miss G. P. Sanborn, $5.

Corsage Bouquet: First, C. S. Goddard, $2; second, Miss G. P. Sanborn, $1.

Floral Design (amateur): First, Lucy B. Burr, Freeport, $5; second, Mrs. A. B. Strattard, $3.

Dish of Cut Flowers: First, Mrs. A. S. Corbett, $2; second, Mrs. A. Cummings, $1.

Basket of Cut Flowers, (professional): First, Miss G. P. Sanborn, $2; second, C. S. Goddard. (Amateur,) first, A. S. Corbett, $2; second, Mrs. F. Hoyt, $1.

Design in Grasses: Gratuity, Mrs. Geo. F. Archer, $1.50.

Greenhouse Plants: First, Miss G. P. Sanborn, $20; second, C. S. Goddard, $15; third, Mrs. E. M. Blanchard, $10.

Pot Plants: First, Mrs. B. T. Townsend, $10; second, Mrs. A. Cummings, $8.

Exhibition of Ferns: First, C. S. Goddard, $3; second, Miss G. P. Sanborn, $2.

Exhibition of Geraniums: First, Mrs. A. Cummings, $3; second, Mrs. E. M. Blanchard, $2.

Foliage Begonias: First, C. S. Goddard, $2; second, Mrs. B. T. Townsend, $1.

Exhibition of Coleus: First (professional), Mrs. E. M. Blanchard, $2; first (amateur), Mrs. A. Cummings, $1.

Rose plants: Second, Mrs. A. Cummings, $3.

Double Geranium: First, Mrs. A. Cummings, 50c.; second, Mrs. E. M. Blanchard, 25c.

Single Geranium: First, Mrs. E. M. Blanchard, 50c.; second, Mrs. A. Cummings, 25c.

Ivy-leaved Geranium: Second, Mrs. A. Cummings, 50c.

Pelargonium: Second, Mrs. A. Cummings, 50c.

Foliage Begonia: First, Mrs. A. Cummings, 50c.; second, Mrs. E. M. Blanchard, 25c.

Flowering Begonia (not tuberous-rooted): First, Mrs. E. M. Blanch ard, 50c.; second, Mrs. B. T. Townsend, 25c.

Tuberous-rooted Begonia: Second, Mrs. E. M. Blanchard, 50c.

Coleus: First, Mrs. E. M. Blanchard, 50c.; second, Mrs. B. T. Townsend, 25c.

Fuchsia: First, Mrs. A. Cummings, 50c.

Ever-blooming Rose: First, Mrs. A. Cummings, $1.

Hydrangea: Gratuity, James D. Pulsifer, Auburn, $1.

Pressed Maine Ferns: First, C. H. Knowlton, Farmington, $2.

Cut Wild Flowers: First, Mrs. C. E. Waterman, East Auburn, $3.

Pressed Wild Flowers: First, Frank C. Merritt, $5; second, Mrs. C. E. Waterman, $3; gratuity, Rockland High School, $10.

Children's Plants, First Premiums: Ralph Rowe, George Judkins, Carl Pomeroy, Henry Glidden, Charles Holderman, Grace English, Edna Chipman, Alberta Rowe, Leon Ross, John Riley, George Babbett, Harold Durgin, Clarence Noyes, Celia Towne, Franklin Fisher, Maurice McCarthy, Thomas Duncan, Lucy Craig, Edgar Barnes, Lewiston; Allen Keene, Jennie Rogers, Ralph Emery, Hazel Sprague, Vina Keyes, Flossie G. Holland, Daniel Coleman, Linn Wood, Mabel Clement, Chandler Bearce, Lila Yeaton, Wallace Hancock, Gladys Lothrop, Helen Sprague, Carl Spearing, Auburn, 30 cent each.

Second Premiums: Carl Wing, Edith Clarke, Annie Wood, Earl Mace, Alice Marshman, Fanny Ridlon, Mabel Sawyer, Wallace Cooms, John O'Connell, Bessie Parker, Geneva Babcock, Charley Fraser, Grace Jackson, Daniel Lisherness, Howard F. Fogg, Della Wilson, Lewiston; Ethel Wentworth, Ralph Chase, Howard Stetson, Helen Randall, Lizzie Briggs, Maud Larrabee, Harry Paul, Ralph Currier, Mary Morris, Charlie Bailey, Lester Brett, Bessie Noyes, Nellie Lombard, Flossie Royal, Allie Garcelon, Susie Dewing, Auburn, 20 cents each.

LIST OF PREMIUMS AWARDED AT THE WINTER MEETING HELD IN PRESQUE ISLE, JANUARY 8 and 9, 1896.

APPLES.

Best Exhibition of Apples: First, O. L. Larrabee, West Levant, $5; second, Chas. S. Pope, Manchester, $4; third, B. H. Ridley, Jay, $3; gratuity, S. W. Taber & Son, Washburn, $2.

Golden Russet: First, B. H. Ridley, Jay, $1; second, Phineas Whittier, Farmington Falls, 50c.

American Golden Russet: Gratuity, Willis A. Luce, South Union, 50c.

Baldwins: First, O. L. Larrabee, West Levant, $1; second, Chas. S. Pope, Manchester, 50c.

Ben Davis: First, A. A. Eastman, Dexter, $1; second, C. H. George, Hebron, 50c.

Deane: First, E. F. Purington, West Farmington, 50c.; second, B. H. Ridley, Jay, 25c.

Dudley's Winter: First, John W. Dudley, Castle Hill, $1; second, Edward Tarr, Castle Hill, 50c.

Fallawater: First, A. A. Eastman, Dexter, 50c.; second, Chas. S. Pope, 25c.

Fameuse: First, S. W. Taber & Son, Washburn, 50c.; second, Columbus Hayford, Maysville, 25c.

Hubbardston: First, Chas. S. Pope, $1; second, B. H. Ridley, 50c.

Nodhead: First, J. W. True, New Gloucester, 50c.; second, A. A. Eastman, Dexter, 25c.

McIntosh Red: First, A. M. Dudley, Castle Hill, $1; second, Edward Tarr, Castle Hill, 50c.

Milding: First, O. L. Larrabee, $1.

Mother: First, Chas. S. Pope, 50c.

Northern Spy: First, A. A. Eastman, $1; second, Phineas Whittier, Farmington Falls, 50c.

Pound Sweet: First, J. W. True, New Gloucester, 50c.

Rhode Island Greening: First, Phineas Whittier, Farmington Falls, $1; second, O. L. Larrabee, 50c.

Rolfe: First, A. A. Eastman, 50c.

Roxbury Russet: First, Phineas Whittier, $1; second, O. L. Larrabee, 50c.

Starkey: First, Chas. S. Pope, 50c.

Stark: First, A. A. Eastman, 50c.; second, E. F. Purington, 25c.

Talman Sweet: First, Chas. S. Pope, $1; second, A. A. Eastman, 50c.

Tompkins King: First, E. F. Purington, West Farmington, $1; second, O. L. Larrabee, 50c.

Wagener: First, O. L. Larrabee, 50c.; second, B. H. Ridley, Jay, 25c.

Wealthy: First, A. A. Eastman, 50c.; second, J. K. Damon, Presque Isle,, 25c.; gratuity, Geo. E. Farnham, Caribou, 25c.

Yellow Bellflower: First, O. L. Larrabee, $1; second, Phineas Whittier, 50c.

Alexander: First, J. W. Dudley, Castle Hill, 50c.; second, A. M. Dudley, 25c.

Black Oxford: Gratuity, C. H. George, Hebron, 50c.

Sweet Baldwin: Gratuity, O. L. Larrabee, 50c.

Blue Pearmain: Gratuity, A. A. Eastman, 50c.

Ribston Pippin: Gratuity, B. H. Ridley, 50c.

Granite Beauty: Gratuity, J. W. Dudley, 50c.

Duchess of Oldenburg: Gratuity, J. K. Damon, Presque Isle, 50c.

Aroostook Seedlings: Best exhibition, first, Orrin Hubbard, Castle Hill, $2; second, Delano Moore, Presque Isle, $1.

Seedling, called Stowe: First, Mrs. Ella Miller, Perham, $1; second, Orrin Hubbard, 50c.

PEARS.

Beurre d'Anjou: First, D. P. True, Leeds Center, $1.

Vicar of Wakefield, Beurre d'Anjou: First, D. P. True, $1.

MISCELLANOUS.

Canned Apples: First, Mrs. F. D. Grover, Bean's Corner, $1.

Evaporated Apples: First, Phineas Whittier, Farmington Falls, $1.

Apple Jelly: First, Mrs. F. D. Grover, Bean's Corner (4 tumblers), $1; second, Mrs. J. W. Dudley (2 tumblers), 50c. Crab, first, Mrs. Eva McGlauflin, South Presque Isle, 50c.; second, Mrs. Ezra McGlauflin, South Presque Isle, 25c.

Jellies, 3 kinds: Gratuity, Mrs. J. B. Dow, Mapleton, 50c.

Jelly, made from the fruit of the high bush cranberry, *Viburnum opulus*: Gratuity, Mrs. Eva McGlauflin, 50c.

Jelly, made from Moore's Arctic: Gratuity, Mrs. Eva McGlauflin, 50c.

Quince fruit: Gratuity, D. P. True, Leeds Center, 50c.

Case of Insects: Gratuity, Delano Moore, Presque Isle, $1.

SUMMARY OF AWARDS AT ANNUAL EXHIBITION.

Apples	$420 75
Pears	65 75
Plums	26 50
Miscellaneous	57 50
Flowers	251 35
	$821 85
Awards made at the Winter Meeting at Presque Isle	59 00
Total	$880 85

PUBLIC MEETINGS

OF THE

Maine State Pomological Society.

PAPERS, DISCUSSIONS, Etc.

PUBLIC MEETING,
City Hall, Deering, April 11, 1895.

ANNUAL MEETING, LEWISTON, SEPT. 5, 1895.

UNION WINTER MEETING,
Presque Isle, January 8 and 9, 1896.

PUBLIC MEETINGS.

PROGRAMMES.

DEERING MEETING, APRIL 11, 1895.

This meeting was held in City Hall, Deering, at 8 o'clock P. M. The exercises consisted of an address by Prof. B. M. Watson, Jr., of the Bussey Institution of Harvard University, on "Hardy Trees and Shrubs."

ANNUAL MEETING DURING THE EXHIBITION.

Election of officers.

Address by Mrs. Alonzo Towle, Freedom, N. H., "People and Homes."

UNION WINTER MEETING AT PRESQUE ISLE, JAN. 8 and 9, 1896.

WEDNESDAY.

9.00 A. M. Tables will be in readiness for display of fruit.

11.00. Business meeting. Report of Treasurer. Report of Secretary. Other business.

AFTERNOON.

Address of Welcome, John W. Dudley, Castle Hill.
Response.
President's Annual Address, John W. True, New Gloucester.
Our Native Cranberries, Prof. F. L. Harvey, State College.

EVENING.

Music.
Small Fruit Culture, J. H. Hale, South Glastonbury, Conn.
Music.

THURSDAY.

FORENOON.

Paper, Chas. E. Wheeler, Chesterville.
Raising Apples for Profit, Chas. S. Pope, Manchester.

AFTERNOON.

A Talk upon Codlin Moth Borers and Curculio, Prof. F. L. Harvey, State College.
Plum Culture for Maine, Willis A. Luce, South Union.

EVENING.

Music.
A Talk on Maine Birds, Lew M. Felch, Ricker Institute.
Music.
Food Value of Nuts and Fruit, Miss Anna Barrows, Boston.
Music.

Papers, Discussions, etc.

AT THE DEERING MEETING.

HARDY TREES AND SHRUBS.

By Prof. B. M. WATSON, Jr., of Bussey Institute of Harvard University.

Of late years, particularly during the last eight or ten, a great deal of ornamental planting has been done in the vicinity of the cities and the large towns. This has had the effect of enhancing the value of the land and I think it is now universally conceded that any ornamental planting is likely to increase the value of the real estate on which the trees and shrubs are planted and the real estate in its immediate vicinity.

BOOKS, ETC., ON HARDY TREES AND SHRUBS.

In regard to the literature on the subject of planting hardy trees and shrubs, there is almost nothing that can be recommended in book form for the New England States. There are plenty of books in French and German; there are English books, but none of them meet the requirements of this country. Our best information on these matters comes from the periodical press.

In regard to the methods which one should choose for planting trees and shurbs, time will hardly permit us to go extensively into this matter; an excellent book on this subject has been written by Mrs. Van Renssalear, "Art Out of Doors," and any one who is contemplating the establishing of any considerable amount of planting, or if they are considering the reclamation of any considerable amount of land, will find valuable hints and information from this book.

BELT PLANTING.

As a general thing it might be said that any planting which was done for protection would be done more or less under the head of "belt plantation." We have a certain amount of land; this land may have a distinct value for growing purposes; it may be good grass land, it may be land from which large crops come and any intermingling or interspersing of trees throughout the body of the land might possibly result in poor crops. The surrounding edges or borders of the field only need be planted. We could have a growth there which is both thoroughly good and which is at the same time useful. There are plenty of crops, particularly those which require more warmth than the climate provides for, a low line of shubbery is an important addition to their welfare and often makes a good crop instead of a poor one.

Trees and shrubs may also be used in the form of a belt plantation to bring out some distant view in the landscape. On the north, northwest, and northeast, you must make the planting pretty dense, and on the south, southeast, and west openings can be left, and the trees and shrubs will act as a frame, precisely as a frame enhances the value of a picture. Just in the same way that trees and shrubs can be planted for enhancing the view of the landscape, so any detrimental appearance can be blotted out, you can plant it out with your trees and shrubs. A modern method of planting shrubs which is obtaining a good deal of consideration from the landscape gardeners oft he present day is this: Wherever a house rises out of grass land, there always is a certain amount of bareness between the foundation stones of the house and the ground. This bareness can be bridged over by a comparatively small and inexpensive planting of rather low-growing shrubs.

It is most objectionable to scatter shrubs through grass. You very often see this where the land is comparatively limited, where only a small amount can be planted, where the owner, perhaps, desires to get a great many different sorts of shrubs he will scatter them through his grass land. If he will confine his planting to the borders and make the belt plantation of which I speak, it would not only be more desirable and the shrubs will be better in every way, but the effect of the planting will be very more harmonious. Avoid a spotty look. Do not dot things round and round; the plants should grow together; they should not be left two or three to themselves.

In regard to cultural directions. The most important matters of which I can speak under this head are in respect to the preparation of the soil. The most frequent mistake that is made by our amateur planters, I mean by those who have had little experience in these matters, is in this connection; they fail to give the soil adequate preparation for the proper growth of the plants.

Wherever any considerable amount of land is to be planted, i. e., if you are planting by the acre in large quantities, the cost excludes practically any other preparation than by plowing, but this can be made very thorough. You can plow and sub-soil, you can turn and till the ground to the depth of eight or ten inches in ordinary soils, and there is no need to say that under these circumstances a certain amount of manure can be incorporated in the soil and if the soil is light and sandy, as it often is along the seashore, there is nothing better that can be added than leaf mold, decayed vegetable or other organic matter.

Where, however, a small number of plants are to be set the best preparation is by trenching. You can trench at comparatively small expense to the depth of eighteen inches or two feet; or if you want a little better work you can go to the depth of three feet, but more than that will not be required.

When you trench you have an excellent opportunity not only of discarding those portions of the soil which are poor, throwing out any stones which may interfere with the proper cultivation of the soil, but you can also add manure. In this connection it should be stated that, if you would give the most careful cultivation to our choicer shrubs you must make the same preparation that you would give for growing fruits, you should make your border deep, you should have mellow soil and you should incorporate manure so that it would last not only for the first two or three years but for fifteen or twenty years; but the expense is very considerable and you would do this only for the very choicest sorts of plants, azaleas, rhododendrons, etc., from which we expect a very considerable return in the form of flowers and foliage.

As far as cultivation is concerned, you must give to such plants at least as good care as you would give potatoes or corn. The plant or tree after it has become established will withstand hard winters, loss of food and trouble with the water supply; but if you want the very best results until these trees become established, I beg of you that you will give them the same care that you would give to the crop of potatoes or corn that you are growing, we will say, in competition for a prize. Go over the ground, weed and see that the surface of the soil, particularly during the hot, dry weather, is kept stirred once a week or once a fortnight. It is very little trouble and it will result not only in a better growth of the tree or shrub, but what is more important it gives the tree a good send-off; it makes it capable of resisting untoward circumstances from the first. Whenever there is any extensive planting to be done it is well to establish a nursery.

Set aside a portion of the ground which is to be devoted to the growth of trees and shrubs and in that plant thickly and still give them space to develop, have the rows three and one-half or four feet apart so as to permit of horse-hoeing and in the rows plant a foot to six feet apart, depending upon the growth we expect, and there let the trees and shrubs grow for a number of years. In the first place, you save money on the first cost; you can get small plants cheaper than you can get big ones; you do not have to pay so much freight; you can have your plants grown under your own eyes, and, if you give them the same care that you would give corn or potatoes, they will grow well. In fact, one of the principal reasons for establishing a nursery is that you have the plants so grown absolutely at your command. If the season opens in March, you can plant in March; if the season does not open until the last of April, you need not be in correspondence with the nurseryman hurrying him up nor are you troubled by too early arrival of the plants. You have them at your command; you can choose that week of the season, that day of the week, which is most suitable for planting.

SPRAY OF HIGH-BUSH CRANBERRY.
(*Viburnum Opulus.*)

Take this in the matter of all coniferous trees. Coniferous trees are somewhat difficult to handle, but when these trees have been grown in the nursery under your own care you have this advantage; you can lift and plant at the proper time at a very considerable saving of money. There is a great demand for our native trees and shrubs. These native trees and shrubs are practically unobtainable in the nurseries, they are not grown to any appreciable extent and almost the only way to get these plants is to go in the woods and dig them up. If you go to the woods and dig them up and plant them you are very likely to suffer severe loss. You must select those plants which are most suitable; the smallest plants are always the best. You are not looking for large plants; you are not looking for plants that will make an immediate show; you are looking for plants that will make the best growth and you take plants that are six inches high instead of three feet. You put them in the nursery and grow them from one to three years and you not only have plants that are otherwise practically unobtainable, but you have them better and cheaper.

IN REGARD TO THE VARIETIES

which are recommendable for planting, you must consider the beauty, the symmetry, the natural good appearance of the tree. It may be beautiful for its flowers, for its foliage, or for its fruit; some trees happily combine two or three of these requisites, while others are grown for their foliage or flowers alone. The plant must be hardy; that is, it must be capable of resisting the circumstances under which it is to be grown; it may be hardy in one place and not in another. This is important particularly when you are planting rather large trees, such trees as would be selected for street planting.

Horse chestnuts are good; they are trees which especially recommend themselves to be planted in the vicinity of houses; their growth and symmetry commend them for that purpose.

The sugar maple is to be especially commended for any purpose where a large, handsome, well-shaped, deciduous tree is desired. There is nothing better than the sugar maple; it is almost impossible to find any fault in it. Its chief rival is the elm; the elm is somewhat more graceful than the sugar maple; it, however, has the bad habit of losing foliage early and it is in some ways perhaps not quite so easily established. Between the sugar maple and the elm it is very difficult to choose; it is almost a matter of taste, about which we know there is no dispute. You will very often when clearing land preserve a scarlet maple. The scarlet maple has the happy faculty of succeeding in land which is wet.

There is one tree which is planted quite extensively, one of the maples, commonly known as the soft maple, sometimes the silver-leaved maple, which I do not consider worthy of planting. If we had no sugar maples or scarlet maples we might plant the soft maples, but the only reason for planting soft maple is that it will grow quickly and you can get a specimen in a few years. If you will plant it with the distinct understanding that it will be cut down when it is thirty or forty feet high to give way to the more desirable maples, well and good; otherwise discard it.

The next is the Norway maple. It is not as good as our sugar maple, but it presents a pleasing contrast. It does not bloom so freely as the scarlet maple, but it blooms before the leaves are well developed and the flowers are a pretty shade of yellow. The Norway maple has been used for street planting, but I think those who have planted it wish they had chosen the sugar maple. It is a very fair tree and it has this pleasant peculiarity, the yellow flowers, which cover the tree early in the season. If the sugar maple was not such a magnificent tree the Norway maple would be a very good tree; but the sugar maple overshadows it entirely.

The yellow locust is a fine tree but very difficult to grow where borers abound. The honey locust, or three-thorned acacia, is very graceful, a quick grower and deserves to be more largely cultivated.

There is here a little group of flowering trees, the hawthornes, flowering apples, flowering cherries and flowering plums. The flowering plums make beautiful specimens when you desire a tree fifteen or twenty feet in height, with a spreading, compact top, fairly good foliage most of the season, fairly symmetrical, you can have nothing better than the flowering plums and apples. The variety which is known as Parkman's is one of the most ornamental of low-growing trees. We have the old English hawthorn with their double pink and white and single scarlet flowers. The trees are very desirable and quick to grow.

The American mountain ash is a charming tree, giving you an abundance of fruit during the autumn months. The American ash and American sassafras are grand trees.

Of elms we have the American elm and the English elm, which is nearly as good. The English elm lacks, however, the graceful beauty of the American elm. The English elm is a compact tree that grows straight up, and has not that beautiful fall of branches that the American elm has. It has an advantage over the American elm in some parts of the country; where the canker worm abounds the English elm does not suffer.

All the oaks are good; the red oak, the black oak, the scarlet and the pin oak are the best. The white oak is a beauty but of such slow growth that it is hardly recommendable for planting. These oaks have a bad reputation among tree men. They are supposed to be slow growers. If you dig up an oak which is eight or ten feet high and plant it in your garden you will find it is a slow grower; but if you begin with a nursery grown tree a foot high and plant in a hole which is made two or three feet across and about a foot deep filled in with good soil, and if you will give it a little care so that it will not be run over by grass or eaten up by cattle, you will find that oak will make a beautiful tree in eight or ten years.

There are in the Arnold Arboretum many specimens which have not been planted more than fifteen or sixteen years which are five or six inches through at the butt. This is true of the pin oak especially; it is one of the quickest growing oaks we have. These oaks were grown under favorable circumstances, they were cared for as you would care for a peach tree.

The same thing is true of the hickory, butter-nut or shag-barks, but if you try to move them from the woods you experience difficulty on account of that long tap root. But if you grow them in the nursery you get plenty of fibrous roots and they will respond quickly to generous treatment.

The American chestnut is one of our best trees; so also is the beech. A man does not want to plant many purple beeches but one or two are desirable.

For quick-growing trees we have the various birches which are highly to be recommended. The European white birch is one of the fastest growing trees we have; wherever it is planted even if in poor soil it will grow and flourish. Willows and poplars have their uses; for wet land there is nothing better than the white willow or the golden variety.

EVERGREEN SHRUBS.

Among evergreen shrubs the Rhododendrons and mountain laurel represents the large and important class of broad-leaved evergreens which are hardy and thrive in New England.

The Hybrid Rhododendrons under careful treatment,—one of the most important factors of this treatment is seeing that they do not suffer from lack of water during the summer months and planting in favorable situations in a deep, rich soil,—are likely to thrive in almost any localities throughout New England. There is a difference in them; some are hardier than others. It is somewhat difficult to draw up a proper list of Rhododendrons without having a knowledge of the locality or experimenting with the plants themselves.

The mountain laurel is hardy throughout New England and also Rdododendron Maximum, although they suffer more or less from hot and dry seasons. Whether it is the winter's cold or the dryness of the summer it is hard to say, but the probabilities are that it is the dryness of the summer which affects the plant so that it is unable to stand the winter. The turning brown of the leaves does not appear until spring and we are in the habit of laying it to the winter, but I think it is the dryness of the preceding summer which has done the damage.

In deciduous shrubs the list is a very extended one. Beginning with barberries, I would like to say a good word for the new Japanese barberry which has lately been introduced, a low-growing, very compact shrub, it has a great amount of fruit and I wish especially to recommend it to anyone who is planting with the intention of feeding game birds, quail, partridges, or song birds during the winter months. The fruit is better, although not more abundant, than that of the common barberry; but there is something in the fruit that makes it very acceptable to the birds; where a large quantity of this Japanese barberry is growing side by side with the common barberry, the latter remains untouched while the Japanese barberry is eaten so fast that it is almost impossible to save seeds.

Among low-blooming shrubs we have the althaea, and hydrangea paniculata grandiflora. They are desirable because the flowers come late in the season after the usual bloom of summer shrubs, and in this class is the witch hazel; it is one of the beautiful things that cheer the landscape in the dull October and November days.

There are many beautiful spiræas. These are plants that I would recommend you to put in about the foundation walls of your houses, wherever you want a comparatively low shrub. One of them grows perhaps two or three feet in height and the other seven or eight feet in height. They are both comparatively newly introduced plants, but their hardiness, their durability, has been thoroughly tested. The low-growing Spiræa, Thunbergii, is distinguished by the great mass of small white flowers early in the season. The flower as seen in a mass is fine, for use as cut flowers it is of small account. The foliage, however, is good. It is rather a light yellowish green and stays on well and during the autumn months it presents the brightest, the gayest of autumnal coloring.

When you plant elms or maples in the street perhaps it may not have occured to you that one reason for choosing them, was because they were easy trees to handle. If they are nursery grown they soon provide themselves with fibrous roots.

We are debarred from using many of our useful and beautiful trees, simply because they cannot be transplanted easily. A tree that will be suitable for the purposes of which I am speaking must be fairly long-lived.

I mention this because there are a great many European trees which have been largely planted throughout the New England and Middle states which are beautiful trees for a short time only. The English oak is one of them; after they attain a certain age they begin to fade; they are not long-lived trees. A good many of the trees will be debarred from the list which I am to present to you simply on that account,—they are good for a short time, but they are not sufficiently long-lived to warrant our planting in any considerable quantities.

This list of plants I have divided into various groups. In the first place, we have the evergreen trees. We have a few evergreen shrubs; I am sorry to say the list is very limited. Then we have deciduous trees, the maple, the elm and the like; we have the deciduous shrubs; there is also a small class of vines which are convenient and useful for many purposes.

We come to Maine to get what I consider our handsomest evergreen tree, that is the white pine. I hope I shall not seem foolish in recommending you ladies and gentlemen in Maine to plant white pines; but there is no tree that is better. It is a tree which will last our lifetime and the lifetime of generations to follow; it is one of the most graceful, symmetrical trees; it is hardy, it will succeed in almost any situation; there are some unfortunate sections of the country where it does not succeed, but there are no conifers, except one, which are easier to handle than the white pine. The white pine is suitable for purposes of protection. There is nothing better than the white pine for a windbreak.

Another good pine is also a native of this part of the country. The nurseries are now having their attention called to the red, or Norway, pine. There is a foreign pine, which composes the celebrated Black Forest in Germany, the Austrian pine, which very much resembles the red pine. It is the handsomer tree of the two; it has a more compact head, it is more symmetrical and at a little distance, in certain stages of their growth, it would be very difficult to distinguish them. If you plant them side by side they will both make a beautiful growth for thirty or forty years, sometimes more, generally less; then the Austrian pine will begin to deteriorate. What happens it is hard to say; sometimes it is an insect that attacks it; sometimes a fungus; something is lacking in our soil, climate or atmosphere which is detrimental, which prevents the tree from making its growth.

The pitch pine for certain work is unsurpassed. It is a very tough tree; it will grow in the most exposed situations, along the sea coast where the winds come off water. You will find that the needles of the white pine, under those circumstances, will turn brown; apparently it does not hurt the tree but it makes it look used-up in the spring. But in this situation you can plant the pitch pine and have it succeed admirably.

There is one foreign pine which is to be recommended; in fact there are two, of one of which I have spoken. The Austrian pine is a thoroughly good plant for a short-lived tree. It sometimes happens that it is desirable to plant a tree that will last only twenty to thirty years, and for such a purpose the Austrian pine makes a thoroughly good tree. The trouble is that it is for a short time only.

The Scotch pine makes this same sort of growth. The Scotch pine, however, grows in much more exposed situations than either the white, red or pitch pine and it will grow in much poorer soil. We very often use Scotch pines to form protection for a number of years, five or ten years, until the plantations of the more enduring white pines, red pines or pitch pines have become established.

The white spruce, another of your common Maine trees, is of great value. Here, again, we have a little difficulty. It is rather hard to get white spruce in any considerable quantity. You can get the plants by the dozen, you can get them by the hundreds and occasionally by the thousands, but they are not to be had in any very large quantities.

The Norway spruce, that is the Abies Excelsa, which resembles very much the black spruce, is in some ways the only evergreen tree which will succeed under any and all circumstances. If you have a poor soil, if you have an exposed situation where nothing else will grow, where nothing else will live, you may be sure that you can establish the Norway spruce. There is only one situation, where the wind comes off the water for a considerable length of time during the year, that the Norway spruce will occasionally fail. All you have to do then is to plant a few Balm of Gilead trees, put up a wind-break, make use of a fence or oldstone wall, and you can establish your Norway spruce and under the lea of the Norway spruce you can get any of the pine or deciduous trees to grow. It is one of the most important plants in planting for protection; it is used by market gardeners and by fruit growers all over the country and takes the place of the board fences.

There is a new species, the Colorado spruce, which is a favorite now among modern tree planters which comes from the highland in Colorado. It is one of the northernmost forms of this plant and promises extremely well. No trees, however, have been in cultivation more than twenty to twenty-five years and we do not know what its future will be.

Another tree from Colorado, the Abies concolor. There is no common name for this plant that I have yet heard. This is a beautiful tree; it might be called the ostrich plume. Its long needles very much resemble an ostrich feather, and this fir is a beautiful tree. It has been grown in some of our gardens and seems to succeed admirably. It has proved hardy and thrives apparently in all soils and situations.

The hemlock, the balsam fir, the European white fir and silver fir, are all good. The hemlock tree is perhaps the best; it is a graceful tree and it relieves the stiffness, the sombreness of the pine and spruce. If you wish to protect your gardens from the cold winds, put in a belt of Norway spruce, then white pines and on the garden side finish it off with a row of hemlocks. You will find that the beauty, the grace of the hemlock will make a much more desirable background for the flowering plants and shrubs in the garden. There is another Colorado species, the Douglas fir, which could be mentioned in any list such as I am giving you now; but it is a comparatively untried tree; we cannot tell what its future will be, but so far as we know it is a magnificent tree, but what it will be in the next fifty years no one can forecast.

Among deciduous trees our choice is much more difficult. The first one I have on my list is the tulip tree; how likely that is to endure your severe winters it is difficult to say, but I should attempt its cultivation. It succeeds admirably with us provided we will begin with small specimens. If you plant a tulip tree ten or twelve feet high you are almost sure to have it die down to the ground. The same thing is true of the magnolias and the Southern cypress when brought north. They ultimately become hardy, if you plant thrifty trees the roots will live and send up shoots and one of those shoots will establish itself. If you begin with trees a foot or eighteen inches high, you are very apt to avoid these unpleasant experiences. If you plant any tulip trees or magnolias, at any rate away from the seashore, I should advise that small plants be selected.

The next tree is the linden and here there is nothing better than the American linden but it is one of the most difficult trees to get in the nurseries that I know of. It is one of our hardiest and toughest trees, especially where the exposure is along the seashore. It will stand along the seashores within a few feet of high-water mark and will withstand the attacks of wind and wave. I do not mean that it makes huge trees under these circumstances, but it will grow and live and that is as much as we can expect. Although it sheds its leaves a little earlier in the autumn than some of our trees, it is not so quick to shed its leaves as the European linden; the European linden leaves us bare poles by the end of August. The the American linden flower is most acceptable to bees.

I consider the European linden a beautiful tree but I want to say emphatically that the American linden is much better and that it should be planted—something that is seldom done largely because it is so difficult to obtain it.

The other spiræais Spiræa Van Houttei and is a garden hybrid. It is about eight feet when fully developed under extremely favorable circumstances and has an abundance of flowers about the last of May. The flowers grow in such great masses that the tree is often bent almost to the ground. It is one of the most symmetrical growers and should be more commonly planted.

I will pass over the well known Hybrid roses, the yellow roses, and climbing roses, and say a word or two in regard to the single roses that have lately been introduced. Rosa rugosa, the most remarkable. come from Japan and have attracted the most notice. There are two forms, the purple and white, and they are thoroughly established in gardens; it seems to succeed thoroughly and is one of our most important plants. This has a large single flower measuring perhaps four or five inches in diameter, one purple and the other white. The foliage is dark green and keeps in good condition during the summer months and the flowers are succeeded by bright, handsome rose heads during the autumn.

The other rose, which is sometimes called the Japanese multiflora to distinguish from an old multiflora that we grow in the greenhouses, is a thoroughly hardy plant and is a rapid grower. It is a fine plant for a trellis or for covering a wall or fence; it must be trained, however, and during the latter part of June is covered with quantities of small white flowers. The individual flower is only, perhaps, the size of a ten cent piece, but there are hundreds and thousands of these flowers on the plant. It is being introduced in some places as a hedge plant and it promises to be a very good one. It has enough thorns, it has a sufficient amount of sturdy thorny growth to fairly protect a field against children or dogs; not against cattle or horses, however.

There are various mock oranges, or so-called syringas. Here is a plant that is desirable because it will grow in the shade. Not grow better in the shade,—it will grow best in the open air and in the brightest sunshine—but if you have shade and you want something or other to grow there, Philadelphus is likely to succeed. This and the red——snowball are almost the only important plants which would grow under this adverse treatment.

The cornels are good, Tartarian honey-suckle, elder, or elder blows, particularly the one with golden foliage, make a lawn or belt of shrubbery plantation attractive when the plants are no longer in flower.

There are a great many Viburnums which attract attention at the present time and two are well known to you, the tree cranberry and snowball, easily attainable from the ordinary nursery.

A Japanese shrub which is worthy of mention is Forsythia. There are two or three species; the best is probably Forsythia Fortuni.

The lilacs are all desirable. There are not only the old common white and purple, but new hybrids are introduced in wonderful colors; they remind you of the French millinery colors in their shades, from the purest white to the deepest purple, almost black. Then we have some new ones from Japan. These are called tree lilacs. If one buys them with the expectation of getting the flowers which we associate with our common lilacs he is disappointed; but they have beautiful clusters, two or three times bigger than the ordinary lilacs, but without the fragrance.

HARDY VINES.

For vines there is nothing better than the various clematis. Everything depends upon the use to which the vine is to be put. To cover a fence or to cover a stone wall plant the Clematis Virginiana, or Virgin's Bower, our wood clematis, and intermingle with it the woodbine, the combination is as good as anything obtainable. If you want a little rarer or less common clematis and one which is perhaps to grow on the porch of the house, use Clemantis Jackmani. This blooms in July or early in August. Clematis Paniculata is a clematis from Japan and is very much like our own "Traveller's Joy," but gives us flowers late in September instead of early in July.

One of the best vines where a number are required, as for instance in adorning the porch or piazza of a house, is Hall's Japanese honeysuckle. It is a plant which has now been established in its cultivation for some twenty-five years, which is thoroughly durable. It gives you a mass, great quantity of white flowers early in the season, as sweet and fragrant as they can be and when September comes it repeats the crop; it is truly an ever-blooming honeysuckle.

The wisterias are among our finest and best vines. We have the Chinese, that which gives you great large of blue flowers early in the season before the leaves are fairly developed, and then we have two from Japan, one with blue and one with white flowers, and these give you clusters of flowers a foot or even eighteen to twenty-four inches in length. Whether or not these will be hardy it is more difficult to say. All the wisterias are subject to bad attacks from the winter, but with us these Japanese wisterias are proving as hardy as the Chinese.

What I have given you I think are likely to withstand your Maine winters; your coverings of snow more than compensate for the lowness of the temperature, and all these plants to which I have called your attention, unless we have made an exception, are plants which stand with us practically without any signs of winter-killing.

At the State Fair Meeting.

PEOPLE AND HOMES.

Mrs. Towle's object in preparing this lecture was to compare the people and homes in other lands with those in the same sphere of existence in our own, also to study, somewhat, their social conditions and broaden our knowledge of the human element if so we can while remaining at home. We are invited to take a hasty trip around the world. To Central America, South America, France, British Isles, Scandinavia, Germany, Russia, Greece, Italy, Spain, the French colonies, Egypt and India. She says finally that, tired of foreign lands and people, gladly we turn our steps homeward, satisfied that "our first-best country is ever at home." We have learned these facts: That in the United States the average standard of living is higher than in any other country; that our independence inspires ambition; that, as Americans, we have much to boast of, and, as New Englanders, much to be proud of. We have learned that we have a variety of climates; that we produce the vines like France, fruit like Spain and all the products of the temperate zone.

Others may choose as they like, but we shall select as a place for a home, the hills of New England, where we are neither scorched with excessive heat, nor shivering from extreme cold, where we fear neither cyclone nor blizzard and where friends are not only dear but near. Strong civilizations have for their keynote and foundation-stone, homes of the right sort; they are built upon truth. Such homes are found scattered all over New England, on the hillsides and in the valleys, each having its clean sweep of lawn, with leafy oaks, maples or venerable elms casting their inviting shadows, telling of grace and charms in nature which are dear to every home-loving soul. It has been said that we cannot produce as much wheat or corn as Kansas and Nebraska, nor such fruit as California, but we have raised men; men whose intelligence and inventive genius have proved the farmer's best friends. These are not accidental happenings. The first fine laws governing homes spring from within, and are directed towards the needs and necessities of the times. Our ancestors in the truthfulness of their lives, recognized these facts. Here boys and girls in the past received their first impressions which have made them a help and blessing in their generation. They were given an inheritance of happiness which comes to those only who make a correct use of life and its privileges. Upon the farm they are taught the things they ought to know, are disciplined to do, dare and bear, are trained to keep their expenses within their income, which is a matter of vast importance at this time when the extravagant ideas of the young are such a hindrance to their financial success and a barrier to marriage.

The farmer and his wife are always in partnership in their business. Although they are ever conscious that many of the opportunities of life and society are lacking, yet they are in a measure recompensed by the gradual strengthening of mutual affection, the result of close comradeship, as the years pass by. One of our needs as a people is, to dignify our profession more and more, to make it not only well paying, but more and more popular every year. Let no chance slip by unimproved when by effort we can in any way help our work to a higher level in public recognition. How shall we save this American home? Sometimes we are fearful it may become a thing of the past and nothing can take the place of refined and lovely homes, not homes for show and name, but *real* homes. This is an age of intellectual activity. Perhaps we need to understand some of the facts involved. Physicians tell us that the third and fourth generations born on the soil have degenerated; that women have deteriorated. They also tell us at the same time that women can be developed intellectually, and brought to as high a standard as men; in fact, are able to go beyond them, but then, as a rule, they cease to be able to reproduce their kind in health and strength. Mental effort exhausts as much as manual labor without the recompense of exercise. When girls are over-stimulated at an age when they ought not to be, and then are crammed and jammed until their lives go out at their eyelids the whole nation must suffer the effects sooner or later. As the American woman only can produce the American man we certainly should be interested in making and preserving these *farm* homes as one saving factor in American sociology.

While women of foreign blood are paying strict attention to making homes, rearing children, etc., the American women are putting aside maternal instincts and refusing to do their best work. The call for a higher education is an inspired call, let no one dispute it; but education is only a means to an end, that end being a higher, happier and better living for ourselves and help extended to those nearest us. Who can predict precisely what the result of any new method will be? We can say only what common sense and a knowledge of natural laws would seem to indicate that the education which most surely puts us in possession of our best selves physically and gives us the knowledge of how and the manner by which we can most surely utilize ourselves, is the best way by far. The path of wisdom and understanding is so broad and leads up to such heights that if we do the best we are able we can leave the imprints of but few footsteps therein. All that we can possibly learn in any direction, compared with what there is to know, is as one drop of water compared with the vast ocean. Therefore with our limited time for work let us choose the most helpful and beneficial. Domestic science, the culinary art and sanitation embrace all the natural sciences and will give to girls a broad culture, at the same time healthy discipline. By thus facing practical work there will be created a new sentiment that will re-instate the duties of every day life and place them pre-eminent, opening the way to the masses of workers, to that respectable place that has long been occupied by those who have not put their hands in joint partnership with their heads. Train boys in their business as well. Let the two well trained classes meet and the result will be the establishing of real homes in peace with prosperity. And when the hillsides and valleys shall have applied to them the result of scientific thought and research they will "blossom like the rose."

At the Presque Isle Winter Meeting.

ADDRESS OF WELCOME.

By JOHN W. DUDLEY, Castle Hill.

Mr. President and gentlemen of the State Pomological Society and Maine Board of Agriculture:

It is with a feeling of pleasure that we of Aroostook county gather with you here to-day, as it is something almost unexpected, living as we do so far from the fruit center of the State, we could hardly urge you to come so far; but we know it is your motto to do all in your power to encourage fruit culture in all parts of the State.

It has been but a few years since we, here in Aroostook, have taken much interest in fruit raising, but we have demonstrated beyond all doubt that fruit growing here can be made a profitable business. Of course we don't expect to raise those fine varieties of apples that you do in the older parts of the State. But there are kinds that we can raise that will, in a measure, take the place of them; and we are getting some good seedlings that originated here that stand our cold climate well. There are a large variety of them that are exhibited at our fairs each year, and we are in hopes that in the near future we can raise all the apples that will be needed for home consumption, and of varieties that are good enough to please any man's taste. Of course we all understand that this has been a poor fruit year for the State of Maine and Aroostook is no exception to the other parts of the State, and as there are less fruit growers and less varieties it could not be expected that we could make an average show here at this time. But I am satisfied that your meeting with us here will be a great help to those who are trying to make a success in fruit culture, and I hope you may see many of them at your fall and winter fruit shows in the future.

I have attended several of these winter meetings in different parts of the State and have always been well paid for time and expense. My first meeting with you was at Damariscotta, eight years ago, and from that time forward I have taken a greater interest in fruit growing. Our friend here, Mr. Hale from Connecticut, was there at that time, and I remember of telling my neighbors when I got home that they ought to have heard his talk on small fruits, and it is a pleasure to me that he is with us to-day for I am well satisfied that this meeting will be very instructive to us all, as well as very entertaining. At the present time, here in Aroostook, I think the farmers will be more than glad to have their attention drawn from the potato question, for we, at the present time, seem to be potato poor, if there is such a thing, but we have one thing to console us, and that is, our cellars are full of potatoes and salt is cheap, and there is no need of any of us going hungry, even if these are hard times, as people seem to be crying.

But if we should stop to compare with the times as they were thirty-five years or so ago, when we used to make shaved shingles and lug them out of the woods on our backs and get them to market the best way we could and sell them for a few groceries getting as low as $1.75 or $2.00 per M. At that time buckwheat and cedar shingles were the only legal tender we had.

This was about the time the Rebellion broke out and every one needed a few postage stamps to send letters to friends who went South, at this time you had to almost beg to get money enough out of a load of shingles to buy a postage stamp. I think those were the hard times instead of now. At that time all of our shingles were hauled to Bangor with teams and goods were taken in return and brought back. And you, Mr. President and gentlemen, could not have enjoyed a ride at that time as you have now over the beautiful systems of the Maine Central and Bangor & Aroostook Railroad.

I remember well, although I was but a small boy, when my father with a family of seven of us started from the town of China to move to this county; we had an express wagon with one horse to haul the family and a double team to carry the goods and we were twelve days getting to this town and the weather wasn't very good either; and now we can cross this continent and back in that time. Now we are within fifteen hours' ride from Boston, one of the best markets in the United States. So you can see there has a wondrous change come to this county within a few years, and the latest and best of them all is the finishing of the Bangor and Aroostook Railroad, which is one of the best systems in New England. Look at our villages covering our beautiful valleys ana hillsides, showing that we are a prosperous and happy people. We have also some fine school buildings in our different villages showing that we are alive to the work of giving our children a suitable education to fit them for the work of life; we have also good churches in all parts of our county showing that we are looking after the spiritual part as well as the temporal and educational. The villages of Houlton, Caribou, Fort Fairfield and Presque Isle are lighted by electricity, and each has a good system of water works.

What has built up these prosperous villages living in so remote a part of the State? It is not manufacturing by any means, it is because they are surrounded with the best farming lands in New England, if we are not the shrewdest managing farmers.

I know we are not too old to learn and it may be that this potato deluge as some call it, with the assistance of the Board of Agriculture in its institute work, and this meeting may work a wondrous change in the methods of farming here in this county.

I wish you could all take a trip to this county in the summer or early fall, we could take you to many places of interest, for you know it was in this part of the State that the great bloodless Aroostook war was fought. Houlton on the southeastern part of the border had its barracks and soldiers and Fort Fairfield had its block-house, and there was Fort Kent on the northern border overlooking the St. John river, and quite a conspicuous place was Castle Hill in those times; their fortress was built on a high hill overlooking the Aroostook river where they could blow the Britishers sky high if any should happen to float up the river.

A story is told, although I would not vouch for the truthfulness of it, that at that time they brought a one-horse load of cannon balls from Augusta to that place and when they got them there they found that they were a size too large for their guns. But I presume the Red Coats never found it out, and it may be that that iron in the soil is what makes fruit trees thrive so well in that section. Perhaps you may think this more like an elegy than an address of welcome.

"But when things don't go to suit you
And the world seems upside down,
Don't waste your time in fretting,
But drive away that frown.

Since life is oft perplexing,
It is the wisest plan,
To bear all trials bravely
And smile when e'er you can."

I believe that this Society and the Board of Agriculture are becoming a great educator to our farmers throughout the State and I see bright prospects ahead if they will but heed the admonition given by you each year. And now, Mr. President and gentlemen, in behalf of the citizens of Presque Isle and vicinity, and in behalf of the agricultural societies of this county I bid you a warm welcome to our village and to our homes, hoping that you may spend the time so pleasantly that when you return home you may say as one did of old, "the half has never been told."

RESPONSE.

Secretary Knowlton was called upon to respond to the address of welcome. In behalf of himself and numerous visitors on the present occasion he thanked the people of Aroostook for their cordial reception. There were special reasons for holding the Winter Meeting in Aroostook. In years past the farmers have found profit in raising potatoes, though year by year the profit has been growing less, till this season there seems a deficit rather than a profit. If our meeting here shall convince some of you that there is both profit and pleasure in growing fruit it will not be in vain that we have come to this border county. The speakers who will address you are conversant with their subjects. They are here to teach, and it is your privilege to draw from them all they can give. There can be no doubt about your raising fruits successfully here. Some varieties you may have to pass by, but you may bear in mind that you are learners and that your experience in fruit growing in Aroostook already illustrates, or rather foreshadows what may be done in the future.

If only we satisfy you that you can raise your own fruits so that Aroostook money earned in other industries may be saved to educate your children and give you more of the luxuries of modern civilization, we shall feel that our efforts have been rewarded. The cordial welcome tells us that you have warm hearts, and it is our hope that our meeting here may result in good to you. We come for this purpose, and at the same time we are glad to meet you and hope the associations may continue in the future. Our society in its work needs the co-operation of all and we believe there are some in Aroostook who will find pleasure and profit in associating with our society. Again thanking you for your cordial words of greeting, may you gain from this opportunity knowledge that will be of service and profit to you all.

THE PRESIDENT'S ANNUAL ADDRESS.

By JOHN W. TRUE, New Gloucester.

Members of the Maine State Pomological Society, Ladies and Gentlemen:

I am much pleased to meet the people of Presque Isle and Aroostook county, to hold our Winter Meeting in connection with the Maine Board of Agriculture, not for the purpose of educating you, but for an interchange of experiences; both of success and failure, for many times it is valuable knowledge to know that this or that method of handling trees or fruit, or in fact anything, was a *failure*.

By the programme you will see that one item calls for an address by the President. It would be impossible for me to present a paper worthy of that formal title, and in place of that I will briefly review some of the transactions of our Society for the past year and add a few suggestions for your consideration in regard to the future.

You will see by our secretary's report for 1894 that, although the legislature of 1893 increased our appropriation from $500 to $1,000, by an oversight somewhere it failed to appear in the appropriation bill and we did not receive the additional $500; and further on he gives you the result of a request made to the legislature of 1895. That additional amount has been received for the years of 1893 and 1894 and our treasurer's report shows what has been done with it. You will see that our indebtedness to the permanent fund has been reduced from $460.27 to $228.69 at the present time. I am very much interested to have that balance against the society paid, and to have our permanent fund so placed and guarded that it shall never again be depleted or drawn upon to pay premiums or the running expenses of the society; and I would suggest that a committee be appointed to devise "ways and means" to bring about this much desired condition. One of the ways that might be well for the committee to consider is whether or not it would be wise to carry all annual membership fees to that account for that purpose.

At our annual exhibition an expert judge was employed, and in the main I think gave good satisfaction. A score card was used in judging collective exhibits, with a scale of points prepared with much care by the Secretary after consulting the best authority obtainable, and published in a pamphlet presented to all former exhibitors and others who called for it. This principle of judging I am convinced is right, but the ratings of the different varieties and the manner of applying the scale should be made the subject of very careful study, so that in its application every exhibitor can see and be thoroughly convinced that he has received justice.

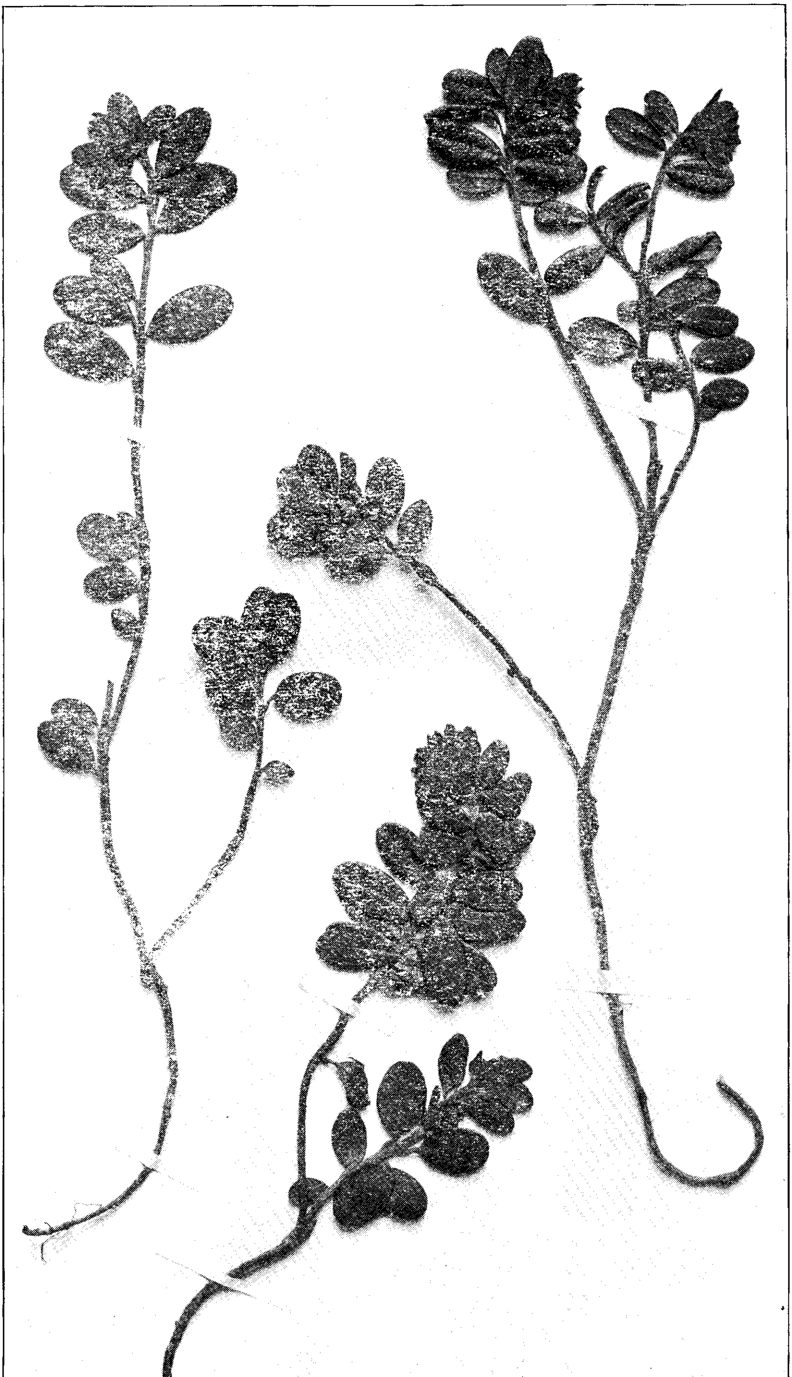
Another subject I would like to call to the attention of the members of this Society (for united action after a full discussion of a subject will secure results that individual effort can hardly accomplish), and that is the immense amount of money and effort that is being spent on testing new varieties of fruit. The "tree agent" has his instructions to push certain new kinds at outrageous prices, and ninety-nine per cent of the money and effort thus spent is wasted. Something in the line of testing new varieties is being carried on at our State Experiment Station, but the loca ion of the station will not answer for the whole State. Varieties that are hardy and desirable for propagation at the station may be wholly unsuited to Aroostook county and the northern part of the State, and the same may be said in the opposite direction in regard to the southern part. As an illustration we will take the Wealthy apple. There is no doubt but that it is a very desirable apple for this section of the State, being a very hardy tree and a winter apple; but in the southern part of the State I maintain that it is not proving satisfactory to the fruit growers, being an early fall apple. That variety alone has cost the farmers many thousands of dollars to test its qualifications and find them wanting. True, they can be re-topped, but that takes time, and much valuable time has been lost already. And what is true of the Wealthy will apply to other varieties almost without number.

Would it not be practical for our Experiment Station, which is maintained by appropriations by the general government for the benefit of our whole State, to establish two or three experimental plantations in different parts of the State, at a very moderate outlay, to do just this kind of testing that depends entirely upon location and climatic conditions for success or failure, thereby saving to our farmers and fruit-growers many thousands of dollars? This will cover not only apples but the many varieties of small fruits that are being extensively introduced and cultivated throughout our State. And as results were obtained, a list of the varieties tested could be published, giving the standing of each variety, and the location to which it was adapted, and then the persistent "tree agent" could be met with this list, and if it was not there refer him to your local experiment station to have his tree or plant tested and the time would come when he would make few sales of such stock compared with what are being sold to-day.

We have many inquiries as to what varieties of fruit shall be set; that is all right, for it makes a vast difference whether the orchard is set with the *best* or *worthless* varieties. I say worthless, for it is a fact that some of the varieties sold by the tree agent, with his little book full of fancy, high-colored plates, are absolutely worthless, for certain sections at least, and an absolute damage to the fruit grower who takes them and sets them out.

It would be more to the advantage of our State and an object for which this society should put forth more energy, to stimulate the desire and cause more inquiry to be made as to how we shall take better care of what trees we have already set. As we travel through our State what proportion, think you, have fairly good treatment, to say nothing of the best treatment that would be profitable to the owner? I will hazard the estimate that not one in ten receive such care and attention. Many trees are planted out, a small proportion of them receive care for a time, and in a few years are left to care for themselves; and it is surprising to see the results that have been attained in this State even with this kind of management, showing that the soil and climate of our good old State of Maine are peculiarly suited to the raising of apples of the finest quality. I verily believe that if every apple tree in our State should receive proper treatment for the next ten years the apple crop would come very near, if not quite, at the top as one of the productions of our farms. And the attainment of this condition is a worthy object for which to put forth our best efforts, and in this way show the tax-payers of the State that we are worthy of all the help that we have received at their hands.

As a contrast to the general condition of our orchards one was visited the past season which is owned by one of our members and one who has taken a deep interest in our Society. I think I may say that it is a model fruit farm, containing as it does some 1,500 trees, all kinds of small fruits and many varieties of each kind, and every tree and each plant showed by its appearance that it had received the best of care and attention in every respect. In cultivation and fertilization there was no lack; in pruning, care had been given each tree as it required from the time it was set, showing that it is seldom necessary to remove large limbs from a growing tree; the foliage was of the proper tint of green; no borers found a safe abiding place in their trunks; no worm's nests disfigured their branches; the ground was perfectly level and smooth; the small fruits and vegetables (for they were in connection) were entirely destitute of weeds; the hedge rows of raspberries, blackberries, currants and gooseberries being in perfect order, all trimmed and cared for, as nearly as I could see, to perfection. And some of the results of such care were to be seen, as the strawberry beds were literally red with large, luscious



MOUNTAIN CRANBERRY (*Vaccinium Vitis-Idæa*). See page 49-53.

fruit, the tables in the commodious, well-arranged fruit house were loaded with crates of berries ready for the market, the raspberry and blackberry canes giving promise of an immense yield, showing that care and cultivation would surely bring their reward. And the thought came that if all our fruit trees could be as well cared for as they were in this orchard, what an advanced position our State would take in the list as a producer of fine fruit.

There is one obstacle with which our fruit growers are now contending, and that is the apple maggot (*trypeta pomonella*), with very little success, and we are hoping that some of the members or our State Experiment Station will soon give us relief from this terrible pest in some practical and efficient treatment, for as it now stands some of our choicest varieties are entirely worthless.

In concluding these few remarks I would say that many more points could well be mentioned as proper subjects for this society to deal with, some of which will be brought forward by the different papers presented at this meeting, and we hope that all present will feel at liberty to ask questions in regard to the subjects presented and enter into the discussions that are to follow, as in this way, many times, we believe that as much thorough, practical information is obtained as we receive from the original paper.

THE CRANBERRIES OF MAINE.

By Prof. F. L. HARVEY, State College.

The term cranberry is derived from *crane* because the slender stalk has been compared to the long neck and legs of a crane, or possibly because the berries grow in bogs frequented by cranes. The application is not obvious. The term is quite loosely and widely applied, being used to designate the fruit of several species of *Vaccinium* belonging to the heath family (*Order Ericaceæ*); to a species of *Viburnum* (high-bush cranberry) belonging to the honeysuckle family (*order Caprifoliaceæ*) and in Australia, New South Wales and Tasmania to the fruit of three distinct species of the *Order Epacridaceæ*, a family of plants related to the heaths. The cranberries of Europe and Asia are the high-bush cranberry, *Viburnum Opulus*, L., which is also a native of North America; the cowberry, *Vaccinium Vitis Idæa*, Linn., also known as the mountain cranberry; and the small cranberry *Vaccinium Oxycoccus*, Linn., known in Europe as the bogwort, mossberry or moorberry. The latter is the kind extensively marketed in Europe and Asia. The others are of no special importance in Europe though the fruit is sometimes used as a substitute for the small cranberry.

Besides the above mentioned European species which are also all natives of America, there are two kinds which are peculiarly American, viz: The white fruited cranberry which is the fruit of *Vaccinium erythrocarpon*, Mx., a shrub growing in the mountains of Virginia and southward and the large-fruited cranberry product of *Vaccinium macrocarpon*, Ait. All the American species excepting the white-fruited cranberry occur in Maine and are considered in the order of their importance.

THE COMMON AMERICAN CRANBERRY.

(*Vaccinium macrocarpon, Ait.*)

Description—Stems about one to eight feet long, the branches bearing flowers ascending; leaves oblong, obtuse, glaucous underneath, four to six lines long and the margins somewhat rovolute; pedicels lateral, severel; filaments about one-third the length of the anthers; blossoms in June. Properly an evergreen but the leaves become brown in winter.

Fruit from one-fourth to one inch or more in diameter. Light green while growing, but changing in ripening to various shades of red or crimson, or sometimes mottled in color. Ripens in September or October. Flavor considered by most people superior to all others, though size and color take precedence to flavor.

Varieties—Three principal varieties are recognized by writers, viz: Bell, Bugle and Cherry, depending upon the resemblance in shape or color to these objects. These varieties run together and produce intermediate ones. The Mansfield Creeper variety is said to grow on uplands.

Distribution—Cranberry bogs are found along the coast of Maine and in the interior; in Massachusetts, Connecticut, Vermont, Canada, northern New York, New Jersey, Virginia, North Carolina, Ohio, Michigan, Wisconsin, Illinois, Indiana, Minnesota, Iowa, Oregon, Washington Territory, Alaska and the Aleutian Islands. The crop of the country is divided into, namely, New England, New Jersey and Western. The New England crop includes all raised in the New England States, three-fourths of which is raised in the vicinity of Cape Cod and known in the markets as Cape cranberries. The Western crop includes that gathered in Michigan, Wisconsin, Minnesota, Iowa, northern Ohio and Indiana. There is also quite a yield in the northwestern part of the United States.

Production is variable being influenced by the soil, moisture, frosts care, fertilization, insects and fungous pests. The yield is from 50 to 300 bushels per acre. A fair average for the county being 110 bushels. Sometime the yield on small areas is at the rate of from 500 to 700 bushels per acre, showing the possibilities if the right conditions could be obtained over large areas. The yield for the county is on the increase. Statistics show that in 1872 the yield was 275,000 bushels, and for 1890, 800,000 bushels. This probably includes both wild and cultivated crops marketed. If to this be added those consumed at home and not reported, the amount would be much increased. Large quantities are exported in barrels to Europe. The barrels hold 100 quarts, but we have no statistics at hand to show the amount, but it is on the increase. In 1874, Mr. P. T. Quinn visited firms in London and Liverpool, with a view to trade arrangements. He found that American berries at that time were virtually unknown in the London markets, that eight years before, five barrels would have satisfied the markets in Liverpool, but in 1874 the demand had reached 100 barrels.

HOW GATHERED AND MARKETED.

In Massachusetts it is done largely by hand. In our Maine bogs quite largely with a cranberry rake to which a bay is attached.

The hand pickers get about ten cents for every six quarts. The money is paid when the berries are handed in or a check is given, redeemed every night or once a week. Lines four feet apart are stretched from ditch to ditch to keep the pickers in place and to secure clean picking. The fruit is put in bushel crates or stored on shelves crib style, the layers twelve inches deep. The fruit is hand sorted for market or sorted by machinery.

USES.

Cranberries are used to make sauce which is largely served with meats, especially poultry. It is also used as a filling for tarts, puddings, cakes and pies. As the fruit is quite acid considerable sugar is required. The berries are stewed fresh. So far as we know they are not extensively canned, but sometimes preserved for winter use.

ANALYSIS OF DARK RED CRANBERRIES FROM NEW JERSEY

Given in the United States Department of Agriculture, 1875, p. 149, is as follows:

Moisture	86.50
Organic mattter	13.25
Inorganic	0.25
	100.00

ANALYSIS OF INORGANIC MATTER.

Insoluble silica	0.874
Soluble silica	2.563
Lime	2.710
Magnesia	Trace
Peroxide of iron	1.253
Phosphoric acid	19.309
Sulphuric acid	5.870
Chlorine	1.260
Potassa	56.683
Soda	9.338
	99.860

It will be noticed that the quantity of ash is very small, being only one-quarter of one per cent.

Of the ash nearly one-fifth is phosphoric acid and over one-half potassa.

We have not been able to find an analysis of the organic portion of cranberries. The organic part is the most important, making up over one-eighth of the weight of the berries. We eat fruits for the beneficial effects of the organic compounds which are laxative, and anti-scorbutic. The organic part must be quite different at the various stages of growth and ripening. The starch of the young berries changes to sugar and the fruits are more acid when mature.

Fertilization: The analysis of cranberries shows, that phosphoric acid and potash salts would be demanded, and experience carries out this fact as guano and wood ashes have been applied with marked increase of yield. Ashes are cheap and are largely used on the Cape by successful growers to supply potash.

Mr. Hersey in a recent paper, read at the Plowman's Farmers' meeting in Boston, states that he does not use any fertilizers on his bogs, but would apply phosphoric acid if anything. In bogs rich in decaying organic matter or in bogs watered by streams charged with plant food in solution, fertilizers would not be needed. The natural resources of the bog should then decide the needs.

Varieties of Cranberry Soils. 1st. Savanna, which consists simply of sand and a small proportion of peaty matter. 2d. Black sand, which consists of pure sand combined with a large proportion of peaty matter. 3d. Turf or moss and sand combined. 4th. Solid peat free from sand. 5th. Pure white sand watered by solutions of peat from adjacent bogs.

A sandy matrix for the plants seems essential for success.

CULTURE OF CRANBERRIES.

The first attempts to cultivate cranberries in this country were made on Cape Cod in 1812 by Mr. Henry Hall of Dennis, Mass. For thirty years the subject claimed but limited attention. At present the cranberry is cultivated in Maine, Connecticut, Minnesota, New Jersey and Massachusetts. New Jersey and Massachusetts giving the most attention to it.

We have no data of the acreage in the various states but it must amount to several thousand acres.

COWBERRY, UPLAND CRANBERRY, MOUNTAIN CRANBERRY, FOXBERRY.

Vaccinium Vitis-Idæa, L.

Description—Low (6–10 inches high); branches erect from tufted creeping stems; leaves obovate with revolute margins, dark green, smooth and shining above, dotted with blackish bristly points beneath. Corolla bell-shaped, 4-cleft. Blossoms in June.

Fruit—Dark red, acid and rather bitter but losing the bitterness when cooked.

Distribution—Coast and mountains of New England to north shore of Lake Superior and far northward. In Maine it is very abundant on the islands along the coast and on the rocky hills and mountains of the interior. We regard this as of next importance to the large fruited cranberry in Maine.

At the request of Mr. Knowlton, I wrote Miss L. Annie Hunter of Machias, Me., regarding this species and received the following interesting reply:

MACHIAS, Me., December 30, 1895.

Mr. F. L. Harvey,

DEAR SIR: Mr. Knowlton must refer to the berry so much prized by "us 'long shore people," and called by us "upland cranberry." I send you a specimen from my herbarium, also a sample of the preserved fruit; a bit of vine as it is found in winter, with its roots and soil.

No berry during the year is thought so much of by the middle class people, along the coast,—the sauce eating class,—as this cranberry. The poorest soil, not more than two inches deep is best for its growth. Small families "lay down" at least a bushel of the fruit every fall, that is, the berries are washed and stewed and packed away in stone crocks and as it is needed it can be made into fresh, delicious sauce by adding equal parts of sugar and stirring well. The fruit thus preserved never spoils. There is no need of straining out the skins, which are very tender, and there is no loss from the berries drying or decaying as with the bog cranberry.

In our local markets the fruit sells for three dollars and a half per bushel so readily that there are none left to ship except as special orders. One bushel is equal to one and a half of the large fruit. I do not know of a case where the berry has been cultivated, as it grows everywhere among rocks on bad land.

A great deal more could be gathered in Washington county than is now used. The case is that every housewife gets her supply and the berry pickers bring no more to town. After the snow goes off in the spring, we see the fruit for sale at the stores for a few weeks. These frost berries are considered very nice, but I have never used any.

These berries will grow on any rocky island on the Maine coast where moss can cling. They only need protection from sheep. I am well acquainted with the coast in this county, and have noticed this plant make its appearance one season, and the next have gathered quantities of berries from the new vines.

Our people have long talked about the worth of the fruit and no summer visitor has ever tried the sauce to my knowledge, either with meat or "warm biscuit" without declaring it much nicer than any cranberry they ever ate.

A law of the State protects the fruit till September 1st, but it is often ripe in August.

The sample I send is not sweetened. If sugar is added in equal parts with perhaps a very little boiling water to help it dissolve, the fruit will jelly as it cools and be very nice.

We have every other variety of cranberry in great abundance. We ship them and use them for jelly to be eaten with meats. They do not at all take the place of the upland cranberry.

I will gladly answer any further questions and can secure roots for planting if desired.

Yours with interest,

L. ANNIE HUNTER.

The following letter addressed to Mr. Knowlton shows that this berry is in great demand in the markets of the large cities.

NEW YORK, May 11, 1895.

D. H. Knowlton, Esq., Secretary of Maine Horticultural Society, Farmington, Maine:

DEAR SIR: We have been referred to you by the United States Department of Agriculture, and would ask you if you could refer us to some party who raises a small cranberry, similar to the one which is raised in Germany, and called (Preiselberren), (Kronsberren).

We understand that these grow in Maine, and as we can use large quantities of the same, we would be thankful to you for referring us to the right party.

Thanking you in advance, we remain

Youry truly,

F. G. STROHMEYER & H. ARPE,

Department for Food Products.

GUSTAVE PORGES,

Manager.

We have submitted the sauce to quite a number and all regard the flavor as superior to that of the large cranberry. The marketmen and grocers inform me that the fruit is offered for sale sparingly in the fall, and brings about the same price as that of ordinary native berries. The ease with which it can be prepared, stored and kept for winter use does away with the objection to its keeping qualities.

As it grows readily and flourishes on waste, rocky lands, it deserves more attention than it has received. The size might also be improved by selection and culture. As there is much less waste its size would be less objectionable.

THE SMALL CRANBERRY.

(*Vaccinium Oxycoccus*, L.)

Description. Stems very slender (4′–9′), long leaves ovate acute with strongly revolute margins (2″–3″ long), pedicels terminal 1-4, filaments more than half the length of the anthers. June.

Fruit—3″–4″ broad spotted with white when young, red when mature.

Distribution. Peat bogs New England and Pennsylvania to Minnesota and northward. It is rarely gathered for market in this country because of its small size and sparse bearing. The flavor is regarded as good, and in Europe, where it is the only available species, it is largely marketed. It is exported from Russia,into Europe. It grows in the moors of England. The importation of the large American berry will no doubt make it less important than formerly. We do not know whether attempts have been made to grow the American berry on the European bogs.

In this country it is regarded as a nuisance in bogs where the large berry grows.

THE HIGH-BUSH CRANBERRY.

Viburnum Opulus, L.

Description—Nearly smooth, upright 4–10° high; leaves three to five ribbed, strongly three-lobed, broadly truncate or wedge-shaped at the base, the spreading lobes pointed and toothed at the sides. Petiole with two glands at the apex.

Fruit—Acid, a one-celled, one-seeded stone fruit, (drupe) pulp soft, stone thin crustaceous.

Distribution—Low ground along streams. From New Brunswick far westward and south to Pennsylvania. It is rather common in swamps and along the river bottoms in Maine. But little need be said about it. No one would be likely to use the fruit for sauce when the bog cranberry or Mountain berry could be obtained. The flavor is regarded as inferior and the stones in the fruit would require the sauce to be strained. In Aroostook county the fruit is quite largely used for making jelly. Samples on exhibition had a very pleasant flavor. It is used to flavor the jelly of other fruits with good results. I saw the bushes quite abundant on Sandy Bay stream near Jackman last summer, and I understand the plant is common in Aroostook county.

PRACTICAL BEARING OF THIS SUBJECT TO THE STATE OF MAINE.

We annually import for home consumption large quantities of cranberries from Massachusetts and New Jersey which retail in our markets from eight to fifteen dollars per barrel according to season and quality.

If we could in any way increase the yield of our natural bogs sufficient to supply home trade it would be a great saving to the State. Our natural berries are light colored and are not so marketable as the imported red ones, though the light colored fruit is of superior flavor and none goes to waste. Our berries are light colored because they have to be picked before they mature to escape frosts. They would be greatly improved by ditches and flood gates to protect the berries until they mature. Lessons could be learned from growers who know how to manipulate light colored berries so as to highten the color.

Fertilizers might be added to our natural bogs so as to increase the size and yield of the fruit and the quality of the pulp. Size, color and quality of pulp determine the grade of the fruit. The success that has already attended the efforts to improve natural bogs in the State, show that there are greater possibilities. The experience of growers in Massachusetts for the past sixty years proves that this crop brings much larger returns for the labor and capital invented than ordinary farming. Mr. Hersey says the price is never so low but what there is a profit, and that cranberry growers make a good living and are anxious to increase the acreage of their bogs. We know cranberries are a luxury and the market can not be cornered for fabulous prices, but the market is not liable to be glutted as the demand at reasonable prices far exceeds the yield. The culture of cranberries is not attended with greater impediments than successful agriculture or fruit growing of large fruits or other small fruits. The returns come quicker and a cranberry bog properly fixed will yield a fair return for a life time. We have no doubt but what there are places along our coast and in the interior well adapted for artificial bogs. Success has already attended the efforts of Mr. Barker of Mt. Vernon, Mr. Wellman of Augusta, Mr. Dill and Silas Wing of Phillips, Mr. A. C. Greenleaf and John Perham of Farmington, and Mr. A. K. Gile of Alfred and others in the improvement of natural bogs and the preparation of artificial ones. So for Maine the experimental stages are past. With some capital, suitable lands, and an interest in the matter success is assured. Nothing at present is definitely known of the area of natural bogs, the amount of land suited for artificial culture, the yield of native berries, the conditions under which the berries flourish best in the State, the difficulties that would be in the way of extending the culture nor the native cranberry fungi and insects. It seems to me that we have here for investigation a subject of State importance. It would seem to me to be a legitimate and important subject for the consideration of the State Pomological Society.

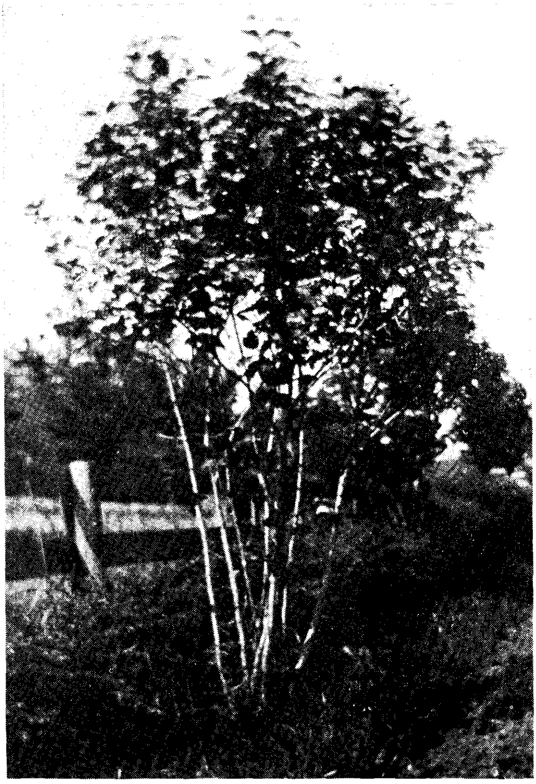
We would therefore suggest that a committee on cranberries be appointed by the society, whose duties would be to look up cranberry culture for Maine in all its phases, as to the desirability and feasibility of extending cranberry culture in the State, the committee to report to the society at some future meeting.

(A committee was appointed, consisting of F. L. Harvey. D. H. Knowlton and W. M. Munson.)

DISCUSSION.

Ques. Suppose I wish to prepare a cranberry bed, what shall I do?

Ans. The first point would be to select a bog. A suitable bog for the cultivation of cranberries would be one where sand could be found near by, and where you could control a stream of water that would do for flooding. The stream would have to pass through the bog so that you could build a dam above it, and flood it at the proper season of the year. It would need to be drained by a drain running down the center so that it would bring the water about eighteen inches below the surface; then drains should be made from above down to this central drain, and a drain should be made on the border to prevent the water from the sides running into the bog. If you select a place where there are trees, the trees will have to be removed; or if there is grass, the sod will have to be removed. And the whole surface of the bog should be covered with sand. I think from what I understand in regard to the culture in Massachusetts that it is not necessary to take off the bog material to any great extent, only to level it and get it in good shape. This matter serves as plant food. The important point is to drain the bog so that you can keep the water from coming up to the roots of the plant, and this bog material beneath would help to serve this purpose. In some of the successful bogs the sand has been put right over the top of the muck. I



HIGH-BUSH CRANBERRY (*Viburnum Opulus*). See pages 49, 55.

can give you only general information, and you will have to work out the question in accordance with the peculiarities of the situation.

Ques. Are the plants set in the sand?

Ans. The plants are set in the sand in rows about one foot apart, and three or four inches deep. The root plants are better, although the branches will take root and grow. In the winter season it is best to flood the land, then in the spring let off the water; and along toward fall, as the fruit has set, keep the ditches pretty full, and if there is likely to be a frost flood the bog, letting the water off the next morning as soon as the temperature will allow, because the water ought not to stand upon the plants very long.

Ques. What are the enemies of the cranberry?

Ans. There are quite a number of insects that affect cranberries, and also they are sometimes affected by a species of fungus which causes decay. In Massachusetts the insects are drowned by flooding the bogs. The flooding of the bogs during the winter has quite a tendency to keep them free from these pests.

Ques. How long will it be after a bed is set before it will come into bearing?

Ans. It will bear the next year, though of course not a full crop. The plants will keep thickening up until they cover the ground, which I think they will do in from five to seven years.

Ques. Don't you believe that very many of the farmers of Maine may with little difficulty prepare a cranberry bog, say six or ten rods square, as the case may be, and get more profit from that piece of land than they can possibly get from such a piece of land in any other way?

Ans. It seems to me that the returns would be very good, and there is but little expense. I noticed in looking up this subject an instance where a man had a bog of several acres, the expense of caring for which amounted to but a few dollars, a mere pittance a year, and it yielded good returns. At any rate, in a country where fruits are as scarce as they are in northern Maine, I should think a good many cranberries might be grown for the home market. I do not know how extensively the bog cranberry grows in Aroostook county, as I have not travelled about much; but it does not necessarily follow that cranberries must be growing at the present time to prove that they may be grown. In a place that is suitable an artificial bog can be made if the conditions are present. If you have the flowage, the peaty soil and sand near by to cover it, you can make an artificial bog, even where cedars or some other trees are growing.

Mr. Hale. The professor speaks of sanding the bog; is it absolutely essential to cranberry culture nowadays to sand the bog at all?

Ans. I have Mr. Hersey's article which was read not more than a week ago, in which he states that sand is necessary for the succeessful growth of cranberries, and I think it is so regarded. One important feature in sanding is to keep the weeds down.

Mr. Hale. The reason I asked the question is that in many of the bogs in Wisconsin the fields have been turned over, and then immediately after drainage they have been planted very thickly, and the vines allowed to take full possession of the ground. The tendency of such a growth is to stop any grass or weed growth and to keep the berries clean. None of the larger bogs have been sanded. These bogs are peat bogs.

PROF. HARVEY. Our natural cranberries grow upon the top of peat sometimes. I presume there would be local problems that would have to be considered. It might be a matter that would have to be experimented on in different parts of the State, the soils differ so much. In some places they put the sand right on top without taking anything off at all, and in other places they skim the top off before putting on the sand. In some cases there seems to be no peat material underneath but simply a sand bank. The cranberries grow because they are watered from adjoining bogs with water containing organic matter in solution for the food, but it would appear that they are growing on very sterile soil.

Ques. Did you mean to convey the idea that bog cranberries are raised in the State with financial success?

Ans. Yes, sir; I think they are. Several parties are doing quite a little business with them. I think Mr. Knowlton can tell you of some bogs that he knows of.

Mr. KNOWLTON. I cannot give data in regard to that, but I am conversant with a number of localities where they are grown quite successfully. I have in mind a very fine cranberry bed within a short distance of one of the largest mountains in the State. The bed is not large, but the success of the owner in cultivating it is very marked indeed. And the only thing strange about it is that he does not take the hint which nature has offered him, of his opportunities, and as the boys say sometimes, "Wade in." For he invariably has a crop of cranberries. To be sure he is favorably situated. He has at the head of his bog an abundant supply of water, and in a couple of hours time he can completely flood the bog, and he can drain it equally quick. He has there somewhere from fifteen to twenty-five acres of bog land, and over fifteen acres of it certainly can be cultivated and cranberries grown upon it without any trouble. The last time I saw the man and talked with him he and his son were putting in three or four short rows of cranberries every year. It requires considerable work to get the bog in condition. It has to be drained, the turf has to be taken off and it has to be sanded. But he is making more money from his farm, I think, than any other man in the town in which he lives, and it is very largely because he is operating this bed.

I am reminded of one thing suggested by the questions which were asked in regard to the success of cranberry beds in the State. I know of quite a number of localities where the beds are run out, and the idea somehow prevails that it does not pay to raise cranberries. The fact in regard to that is just the same as it is in regard to any kind of farming—it does not pay to half do it. But if you take advantage of the opportunities which nature has offered to you in almost any direction, you do not know how speedily and how bountifully she will respond to your efforts. The neglect of improving these opportunities is the occasion for many of these bogs being run out, and the idea is abroad that it does not pay to raise cranberries. The object (if you will pardon me for referring to it) in having this matter presented at this meeting is to call attention to the resources which nature has given us in the State, and to suggest or to emphasize the line along which we can work the most successfully. There are a few small beds in the State where enterprising farmers, who want a few cranberries for themselves, have set out a few vines, and they are getting quite a lot of cranberries; but they are not raising them as a market crop or anything of that kind, but simply for their own satisfaction; and there is an unlimited pleasure in that sort of thing. I hope that what the professor has told us here will encourage us to investigate this thing still more and experiment along the line that nature suggests, thus insuring more profitable work in this matter of cranberry culture.

Mr. VINTON. The simple truth in regard to us in Maine is that we do not try to do anything with this crop. It is amazing that we should permit that state of things to exist. We have the bogs, lots of them and of the best kind, and all that is necessary is for us to go to work and raise the cranberries. Two things may be said in regard to this crop and said with truth. First, it takes but a very small piece of ground to produce a barrel of cranberries; second, the cranberries are worth $12 a barrel. Now isn't that better than raising potatoes this year?

Prof. HARVEY. Let me quote a few words from Mr. Hersey: "Never engage in cranberry culture unless you can locate where the conditions are favorable; never purchase the plants from localities where destructive insects have injured them; never set plants that are not prolific bearers and do not produce berries of a thick flesh (of course it requires some care if you are going to select them from your own home bog, or you would have to deal with reliable growers); never half build a bog; and finally, let the business alone unless you care enough about it to make yourself familiar with all of its details, from the selection of the bog to the marketing of the fruit."

Ques. We have quite a number of high bush cranberry vines, but some years we do not get any cranberries. What can we do to cause those vines to bear?

Mr. KNOWLTON. I have no doubt that annual fertilization and pruning would improve those bushes. I have had but very little experience with the high-bush cranberry which grows so spontaneously all through Maine. I always admired the beauty of the flowers; and, by the way, it is one of the most beautiful decorative shrubs that you will find in the State or in New England. If you examine the reports made by those who are familiar with the subject and who recommend varieties or species of trees and shrubs for ornamentation in New England, you will find that almost without exception this viburnum is recommended. It is a beautiful thing in flower, and it is a beautiful thing in fruit. Some years ago when I settled on the place where I now live I wanted some of these shrubs for the flowers, and I have three or four bunches of them. They happen to be growing where they get a good deal of wash from the garden, and when I am going around with ashes or bone meal I take a good deal of pleasure in throwing a few handfuls around the roots of the shrub; and up to this time I never have failed to have an abundance either of flowers or fruit. This may perhaps answer the inquiry which was made in regard to the matter. At any rate for ornamental purposes if for no other, the shrub deserves a place on our grounds.

Mr. HALE. I have been interested in this discussion, and the remarks from the gentleman on my right in relation to what may be produced from a few square rods of ground properly planted and cultivated, in cranberries, are unquestionably correct. But to give out the idea that because cranberries are selling this year for twelve or fourteen dollars there is any possibility of obtaining that as a commercial price is a little misleading. The average market price for the last ten years will hang pretty close around five dollars. But even at that price it is well to consider the value of our swamp lands here in New England. I think we have overlooked that altogether too much. Wherever there is an opportunity to develop those lands by the production of some crop which will take the place of the grass and worthless weeds, it is our duty so to do; and as the cranberry grows wild, there is no reason if the conditions are favorable, why those bogs may not be turned into a profitable piece of property. But I question whether it will pay to establish small bogs, an eighth to a quarter of an acre, as the expense in preparing for flooding is so great as to eat up the profit. There are many large bogs, however, all through New England, that could be taken up as commercial propositions and made worth many times more than the whole farm. A few years ago there were cheap swamp lands in sections of Michigan and Ohio which were not considered worth five dollars an acre. Some bright, intelligent man took a small tract and developed it into a celery farm, and to-day you hear about the celery that comes from Kalamazoo, Mich., and Akron, Ohio, and you cannot buy that land for five hundred dollars an acre. It is not worth a dollar more, but some man has shown the possibilities of it, and it is turning out celery that is brought right into our New England markets. Our people do not awaken to the importance of what our soil has within it. Our opportunities in all these lines are almost too good; we do not take advantage of them. We can live by neglecting the most of them, and so we do. If it were a little harder to make a living on a Maine farm we should get more out of it.

Prof. HARVEY. In regard to the price of cranberries, what I meant was this; I do not believe that any one person in Maine has bought cranberries at retail for less than eight cents a quart, and as there are thousands of bushels imported for home consumption it will be a good while before there are enough raised to glut the market, so that we could not get the retail price.

Mr. KNOWLTON. There are two points that I want to emphasize a little. The cranberry which the young lady from Machias has written the professor about is a variety that grows all along the coast on land that, as it stands, is absolutely not good for anything except to drive over to get from one place to another, and perhaps chase deer and in a few spots dig out granite. There is hardly any soil at all. There is a lot of waste land that is peculiar to a large part of our State. Now if we can only manage to scatter these cranberries abroad in such places, we can utilize this land, and we can have a great many more cranberries than we have now. That is one point.

The other point is in the line of work which we, as fruit growers, have reason to expect from our Experiment Station. It is established, of course, to teach us so far as possible, the possibilities of the State, and here is a line along which I hope they will work, hoping that in the future we may get out of it perhaps a more profitable cranberry even, than they have on the Cape, by cultivation. At any rate, if we can get something where we now get nothing we will be so much better off, materially, spiritually and every other way.

Prof. HARVEY. The people all along the coast from Penobscot Bay east, use these berries that the Secretary speaks of for home consumption in preference to the others, and there is an abundance of them. We find them abundant in the markets in Bar Harbor in the fall season. They grow even up on Katahdin, and seem to thrive well on our Maine sterile soil.

SMALL FRUIT CULTURE.

By J. H. HALE, South Glastonbury, Conn.

The subject that has been assigned me this evening is that of small fruit culture, but before entering upon that, in a rambling way I want to say a word upon the general subject which is considered at these meetings, and the work which is fostered by this Pomological Society. Within the past five or six years it has been my privilege to study the fruit industry of this entire United States. Several of the special investigations of the last census were under my direct charge, and in studying the problems that came before us I was impressed with the magnitude of the fruit industry of this country, and with the growing consumption of fruit throughout the country. In travelling through the Central and Western states, in the far West, beyond the Rockies, and in the South, I found great orchards and vineyards being established, 50 or 100, or 200, 300 or 500 acres in extent, by business horticulturists who are seeking to get liberal returns from their capital. Investigating further as to what is going to be done with this fruit,—finding an orchard beyond the Rockies, in Arizona, in New Mexico or Georgia, as the case might be,—I found that the majority of those planters were looking to the northeastern section for their money. If you ask them where they are going to ship their fruit they will say north and east, and tracing it down I found that the great majority of them were looking to the extreme northeastern part of the country, I mean the territory east of Philadelphia, which comprises largely our great New England. In my study of the floral culture of the United States I asked a great many questions through the regular census enumerators. I found the number of floral establishments to be 5,000. The superintendent of the census gave me liberty to begin my investigations where I would, and I went back to the beginning of this century. I found that there was but one commercial florist's establishment in 1800; during the next ten years twenty or thirty were added, during the next ten, forty or fifty, and so on down to 1860; from 1860 to 1870 several hundred of these establishments were added, and from 1880 to 1890 nearly 3,000. These florists were selling, in 1890, twelve million dollars worth of cut flowers and about fourteen million dollars worth of potted plants. Twenty-five million dollars paid at wholesale by the people of the United States for these beautiful flowers to adorn their homes! What has that to do with fruit culture? Refinement, and the love of flowers, and the love and taste for fruit go hand in hand. As people become more cultured they demand more of the finer products of the soil and less of the coarser. We asked a great many questions in our investigations, as the census enumerators always do. We asked the florists a great many questions about their business, whether it was increasing or decreasing, etc.,—seven or eight hundred different questions. To sum it all up, we found that as the people became more cultured and refined they were buying more flowers. And I found that in my dear old New England they were buying twice as many flowers per capita as anywhere else in the United States; showing that the people had the ability to buy and the taste to buy. And the same thing holds of the fruits. But when I went off North and South and West and found these great commercial orchards, I wondered why it was that the people of New England did not wake up to the fact that right here is the best market on the face of the globe for these fine products; and I realized that these farmers were neglecting their opportunities to open up a market and supply the market with what they might produce. Here in New England we are restricted by climatic conditions to certain varieties, but there are many fruits that we can grow here better than anywhere else in the Union.

The first thought that came into my mind as I came into the hall and saw these apples was, why is not Maine advertising as they are in Missouri. You see in all the papers, "Come to the land of the big red apple!" Why is not the State of Maine advertising, "Come to the land of the big red apple!" and you might add, of a good quality, too. We are missing our opportunities that we do not take hold of some of these things.

This is entirely out of the line of what I intended to say, but I am glad that you have in this State a pomological society that is taking an interest in this matter, and that you citizens of Aroostook county, by your attendance here are showing that you are taking an interest in the pomology of your State, in the production of these finer products of earth.

This subject of small fruit culture is of particular interest at this time and place because, owing to your climatic conditions, you cannot grow all the choicer varieties of tree fruits that may be grown in other sections of this State, or in other sections of New England. But the small fruits may be grown almost anywhere. They have a decided advantage over any other fruits inasmuch as they come so quickly into fruitage after planting. Strawberries planted one year will, the next summer be in full and abundant fruitage, yielding almost as many bushels to the acre as you can get potatoes in Aroostook county. I sold my strawberries at from three to five dollars a bushel, and you can hardly match that with potatoes. Most of the other small fruits come into bearing in one year; some need two or three years. There is nothing in the way of fruits, for the ease of culture and the quick time in which they give us returns, that will compare with small fruits in value, and most of them are very hardy. From a great number of varieties we may select species that can be grown on almost any soil and under almost any changes of climate. So I bring them to your consideration here to-night as an important factor in home life upon the farm, or home life anywhere where you own or are able to till a single rod of ground; as something that, for the money, time and labor invested, will give you greater returns in health and happiness than anything you can put into the soil. The question of dollars and cents is another one; but as the Secretary said in his talk this afternoon, that is not the big thing to be considered. We should not get the dollar before our eyes so big that it clouds everything else. The first thing to be considered, it seems to me, is the health and happiness of our families. We must, of course, produce that which will give us enough money to provide for our wants, carry on the burdens of the county and State, etc., but life is pretty short, and I believe that everyone should get just as much enjoyment out of his business and in his home life as he possibly can. This is the first thing to secure, and the greater number of dollars is secondary. But naturally we are apt to lose sight of this fact. Life on the farm is hard, and what little money we get comes harder, and in the struggle for that we get led away from the higher and better things of life.

But in regard to the matter of small fruit culture, there is no reason so far as I know, and I know something of your soil in this county, why every home in this county should not have a full, liberal, well rounded out supply of small fruits through the three months of summer, and in the southern part of the State, all the year. How many of you are growing a good supply of small fruits for your families? I tell you your wife and children will enjoy strawberries a great deal better than they do raw potatoes. There is more fun and happiness in growing them. You grow potatoes to make your back ache; you load them into the cart and haul them to the station and ship them to Boston in order to get something to make your family happy, while right out there were bushels of choice fruits that might be had for the asking without any freight to Boston and back, by selecting the hardy varieties that would stand your climate and cultivating them.

First, the strawberries. There is no serious problem about the culture of strawberries. It is not much more difficult for me on my farm to grow a bushel of strawberries than a bushel of potatoes. There isn't any deep secret in success in that line. For a family garden, select a good piece of land as near the house as may be, plant in long, straight rows your strawberries, blackberries, currants and gooseberries, and let the old horse and cultivator work up and down those rows every summer. Lay down the raspberries and blackberries in the fall if they are the tender kinds; give them a little pruning at the right time, a little pinching here and a little pinching there, and that is all there will be to it. It is not because you do not like them, or because your families do not like them that you do not cultivate more of these choice fruits. Strawberries may be planted in rows two and one-half or three feet apart and fifteen or eighteen inches apart in the row, according to the variety; one plant in a place. In the spring they should be cultivated once or twice a week and hand hoed once in two or three weeks, and so on through the summer, and mulched in the fall. The next season from that bed take some plants and set out a new bed and plow under the old one, and so on year after year, with little expense in field culture. If it is too much work to hoe them you may plant in check rows and run the cultivator two ways between the rows until the plants begin to run, and then one way. Raspberries and blackberries should be set in hills five or six feet apart each way, and the horse and cultivator made to do all the work. When they attain a height of fifteen or eighteen inches pinch the tops and let them stop growing. Currants should also be planted in check rows so that the horse can cultivate them, and given a little judicious pruning at the right time. They may be planted either in the fall or spring; even with your trying climate you could not kill the currant bushes if planted in September or October. Liberal pinching in of the new growth in midsummer will stimulate the setting of fruit buds and you may grow from a single currant bush from six to ten quarts, under a high state of cultivation. Gooseberries require much the same treatment, planting either in the fall or spring, pinching back in midsummer, thinning out the crowded branches and manuring deeply. There is nothing difficult about the cultivation of these fruits, they are the most kindly things that grow. Plant small fruits in almost any way you will and cultivate them in the most shiftless manner and yet they will give you returns; but like the apple tree or the good dairy cow, the more skill and care you apply the greater returns they will give. You may grow strawberries, twenty-five bushels to the acre, under the most shiftless culture, up to 250 or 300 bushels under the highest method of culture. It simply rests with the owner of the soil what his returns shall be.

The question of soil depends greatly on the variety. You may grow strawberries, as a general principle, upon any soil that would be good potato soil. Some potato soil may be a little too damp and heavy for certain varieties. Some varieties grow very much to foliage, and need lighter, drier land; other varieties will not grow on the driest land. There is a natural selection of the soil.

In growing raspberries and blackberries you want the most hardy varieties. Many of the varieties that will thrive in Delaware and Maryland, like the Wilson's Early blackberry and the old Hudson River raspberry, will not stand your climate. Others like the Snyder, varieties of that kind, with a little winter protection, would fruit here every year. The more hardy of the Doolittle type of raspberry, planted on high ground and given a little winter protection, would undoubtedly thrive here. Currants and gooseberries are hardy enough anyway.

The question of winter protection is not a very serious one. We talk about laying down raspberries and blackberries, and it looks like a very difficult job. But the men who do it by the acre say that it can be done at a cost of eight or ten dollars per acre. For a family supply you do not want an acre, or a half acre; a half a bushel of fruit a day is a good rational supply with a clear conscience and a large family. Those of you who buy two or three quarts occasionally will think this is a good deal, but the difference between the fruits you buy and the choice fruits raised on your own farm makes a difference with your appetite and the power of consumption. We have a great many farmers who do not grow any berries, but tell their families it is cheaper to buy. They say, "I tell my family I will buy them all the fruit they want," but they do not come up to it, anywhere near. We save back some berries on Saturday for these neighbors. Some of them will drive up and say, "Have you got any strawberries to-day, Hale?" We will say yes. "Well what are they worth?" Perhaps they are worth ten or fifteen cents, and he will pull out a pail and say, "What will that hold?" We will say, perhaps, eight quarts. "Well, fill it up." And he pays for it with the air of a man who says, "Oh, I give my family everything under the sun they want." He gives you a sort of impression that he is wonderfully liberal. Ten chances to one he don't get home in time for supper, and they don't have them for breakfast, as the people who do not raise strawberries do not get accustomed to having them for breakfast, and so they hang around till noon. Perhaps just about the time they go to church the old man who has been so liberal, will say, "Mary, I would like a shortcake for dinner to-day, wouldn't that be nice?" She heaves a sigh and says, "Yes." And then says, "I guess I wont go to church to-day." He goes to church and prays for the heathen, and she stays at home and works for the heathen right in her own family. That is about all the strawberries that family gets. And there are a great many families where that thing is true, in New Hampshire and Massachusetts at least. Maine may be free from it, but I think you might find it true in some part of Maine, probably down in the southern part.

This is an important question,—the supplying of your families with the best of everything. There is no one on earth that can live as well for a little money as the farmer and his family; and there is nothing that will help them along to-day any more for the money invested than the cultivation of flowers and small fruits; and next the other fruits.

The question of fertilizing the small fruits is much the same problem that enters into the feeding of all our fruits. Liberal applications of potash and phosphoric acid should be made, but very little nitrogen. The use of nitrogen, either in stable manures or commercial fertilizers, stimulates a rapid wood growth which is more susceptible of blights and more liable to be injured by winter frosts. For the most successful culture of small fruits dodge the nitrogen. I would prefer not to use stable manure, but I would use that rather than none at all. Bone meal and potash in its most economical form, probably wood ashes in this locality, will give you strong, healthy growth and a hardy wood to stand the frosts of winter, and at the same time will give you firm, bright colored and high flavored berries.

In strawberry culture it is well not to let the plants crowd too much. The worst foe of the strawberry is the strawberry itself. If allowed to grow too thickly and mat in the rows the vines will produce small berries, and you will not get as good results. They want to be given an abundance of room.

Here is this wonderful county of Aroostook where you have such magnificent fields of strong, fertile soil and late seasons which give you the markets southwest of you, it seems to me there is a wonderful chance for commercial small fruit growing. I believe if some of you here, instead of planting so many acres of potatoes would plant those same fields in strawberries or raspberries your returns would be much greater. Blackberries would come so late as to come into competition with peaches in the markets of Boston or Portland, but strawberries would come into the market after the other growers had ceased to supply them. I do not know what the express rates are, but certainly if your neighbors over here in Nova Scotia can grow strawberries and send them to the market at the very great profit which they are getting, you people here can exceed them in many ways. And I think there is a wonderful opportunity for commercial strawberry growing in this county and in this vicinity. I believe a ten acre patch of strawberries, well planted with proper selections of varieties, and well cared for would bring greater net cash returns than any fifty acres of potatoes in your county. Of course the cost of production would be far greater, as there would be the cost of picking, and the cost of culture would be more and the cost of plant food, for they are liberal feeders and require to be fed well. Farming is similar to manufacturing processes; the greater amount of raw material we supply the greater returns we get. In entering into the business from a commercial standpoint you want to produce the largest and finest colored berries you can get, and then, after you get the size and color, as good quality as you can get. If we want to open the pocket books of the people in the markets we must get their eye first, not their taste. You will have to select raspberries with some firmness, because your markets are at some distance. Pick in the cool of the day and grade as you pick, into two sizes. Pack the fruit nicely from top to bottom, with no topping up to make it appear better than it really is. Do good, honest packing. Have your baskets well rounded, and make them just as showy as you can. Select the whitest baskets you can find, pack the fruit nicely in these and put them in white clean crates. Of course make it just as cheap as you can, but have a handsome package. Then select some retail dealer or commission man who has a name and a good reputation in the market, and impress on his mind that you are trying to produce fine fruit. Toot your horn all you want to after you have produced fine fruit, and then make the public pay for it, and they will do it. The men who are making money in small fruits, just as in any other business, are the men who are doing business in the best way. There is no thinking that you can fool the public. If you put inferior grades of small fruit or apples into the baskets or barrels, and a finer quality on top, you will get for the whole the price of the lowest grade. But if you pack the fruit nicely you will soon get a big price for it, and after a time you will have a name; and a good name is not only better than great riches, but it *is* great riches.

I think there are opportunities in this line that have been neglected, and I think the possibilities for strawberry growing in this section of Maine are very great indeed. There are certain kinds of fruit that people will eat for a time and then drop. But there are two things that they will never drop as long as they can get them in good condition,—strawberries and peaches. They will eat these as long as they can get them. They are beginning now to eat strawberries from California and they would eat them in August if they could get them, long after the Massachusetts and New Hampshire crops are out of the market.

We are too apt to imitate one another in all our work. In one section of the country a few men are successful in producing a certain crop, others follow them and that neighborhood gets into that one rut, and you all produce one crop. The men who are succeeding in agriculture and in fruit growing are the men who strike out in new lines for themselves. The men who succeed in manufacturing lines are those who have individualized their own work, made themselves known by making a special product. And so it is with us farmers. We follow along the same lines that our grandfathers and fathers did, or even that we ourselves started in; but we must adapt ourselves to the times, and there is a wonderful growing demand for these fruits and some one has to supply it. Why should it not be you people here as well as some one else? To give you some idea of the wonderful increase in the small fruit business, I will give you a little instance. I have been a lover of fruits from a boy. I was born on a farm, reared there and had to stay there; but my taste was in fruit-growing lines and so I drifted entirely into that, and I thank the Lord that he headed me that way. In my boyhood days the city of Hartford, to which I lived adjoining, had a population of more than 40,000, and at that time there was but one commercial establishment in that city that sold fruit. Standing in front of that store one day, looking at the pineapples and other fruits that were there, the proprietor, who was standing outside in his shirt sleeves, slapped me on the shoulder and said, "I have sold six bushels of strawberries to-day! What do you think of that?" I thought it was wonderful, and I hoped the time would come when I could grow two or three bushels. There were at that time in the county but two commercial strawberry growers, and they both brought their fruit there for him to sell. A few years ago I took a special census, and I found more than 200 establishments in Hartford selling berries, and they are selling over 600 bushels a day. An increase from six bushels to six hundred in a short lifetime. I was talking with Mr. J. E. Eddy at our last pomological meeting two weeks ago, and he said they were consuming 1,000 bushels a day in the height of the season. Just think of that! An increase from six bushels a day to 1,000 in the last thirty-five years, and the population now is less than 60,000. An increase of thirty or forty per cent in population and 1,000 per cent in the consumption of berries. And that increased consumption is going on everywhere. Since I have been in the business I have heard about its being overdone, and the market is occasionally overstocked, but it is with poor goods. There is never an over supply of the best goods. Of course you could all go to raising strawberries and overstock the market here. You have to find a market that wants the goods and the time it wants them, and then you will get your money back, there is no question about it.

I cannot come here and tell you just what varieties to plant and just what soil to plant them on. You must work out those problems for yourselves. Those of you who are growing strawberries here can tell the farmers about that better than I can. I can give you a few hints, and I do want to stimulate your thought in the line of these choicest of fruits. I have in mind that possibly currants would be a very profitable crop here. I have friends in Nova Scotia who began planting currants for the Boston markets a few years ago. They planted a few acres at first, and within the past year they have said they intended to enlarge their operations, one to about ten acres and the other to about eighty acres. They say they are very profitable, and I believe you here would find the currant a very profitable crop. It is hardy, very productive and long lived. You could not get half as much from an acre as from an acre of strawberries, but it will not cost nearly as much to produce them. The cost of production is very small as compared with strawberries. They should be planted in check rows, perhaps five or six feet apart each way. The bushes when a year old need cultivating six or eight or ten times during the season, the more the better. They will require two years' growth before they will come into bearing at all. The first year they might be planted between potatoes, and the next year given the full use of the ground. The third year they will come into moderate bearing and the fourth year into full bearing. And then if fed, cultivated and judiciously pruned they will bear almost indefinitely.

A good currant crop may be kept up for fifteen or twenty years and sometimes more, though if forced to their utmost you will get the best returns within that time. The yield on naturally stony soil will be in the neighborhood of one hundred bushels per acre. And these would come into the market when there is no competition. It is a good thing to be just ahead of or just behind the other fellow, and with currants it is a good thing to be just behind. The bulk of the market will come in perhaps Monday or Tuesday. Everybody picks them and runs them in the first of the week. The mistress wants half a bushel and she consults Bridget. "The ironing won't be done before Wednesday night, and Thursday I have all the swaping to do, and I couldn't get at it before Friday." And by that time they are all gone. Not half of them come into the market when the people are ready to handle them. We find an advantage with the Victoria in that they will stay on the market for a week or so. We hold them until the others are out of the market and then double up the price. And I believe that as your currants up here come late you would find a good market for them. Currants are never sold at a very large price, and the market is never overstocked, but is always steady. From $2.50 to $3.00 a bushel is the wholesale price. They are not perishable on the way, and you could ship them by freight at a moderate cost. I think the strawberry and the currant are the two small fruits that should be considered here from a commercial standpoint. The others will come in their places, red raspberries next and black raspberries fourth. There is a moderate demand for gooseberries, but none of the markets handle them in any large quantities. Choice gooseberries are in moderate demand, and the manufacturing towns where there is a great number of English population buy more than any other places. Blackberries would come late and come in competition with peaches; that is the one objection to them.

DISCUSSION.

Ques. What do you consider your best variety of red currant?

Ans. This best variety depends upon a great many things. The largest and choicest currant is the Fay, but it is fickle. The Fay on certain soils is very vigorous in growth and very productive. On other soils it makes but a moderate growth and is a shy bearer. It seems to bear itself out in three or four years. If liberally fed and properly pruned it may bear enormously for three or four years, but will not bear so heavily after that. The old Cherry is probably the best known and the most generally planted. It is a fine currant but makes a straggling bunch. The Victoria is a medium sized currant, a little larger than the old red Dutch. It is vigorous in growth, holds its foliage until late in the season, holds its fruit for a week or ten days and makes a good jelly. For all around purposes I consider the Victoria the best of the currants that are well known. Do not plant anything that has not a good foliage, especially in a trying climate like this. A good foliage is an indication of character and strength and is of great value. My experience is that a bush or tree that holds its foliage late in the fall is in a better condition to stand the winter than one that sheds its foliage early.

Ques. In regard to propagating gooseberries and currants?

Ans. Currants are readily propagated. In the fall after the foliage is off cut the new wood of the season's growth into sticks six or eight inches long, as may be most convenient. An eleven inch stick you could cut in two, but you could hardly do this with an eight inch stick. Try to make them six or eight inches long; then take those cuttings and bunch them up, putting the tops all one way, and bury them in sand in the cellar, or if you wish in a side hill where there is a good drainage; or plant them directly in the field where they are to grow. Plow a piece of land in October—plow it thoroughly, and stick them in the ground with a dibble, or in any way to get them so that they will be level with the ground. Tread them down and cover them with a heavy mulch. In the spring take off the mulch and tread down again. I prefer to put them in in the fall. Many keep them in sand and put them in in the spring. Gooseberries may be treated in the same way, but unless you have a cool, moist spring not more than forty per cent of them will start, and not more than half of those will take root and make a good growth. The general custom of most propagators of the gooseberry is, in midsummer when the plants are growing well, to bank right up around the bush with earth three or four inches above where the sprouts are growing, and the most of this young growth under the earth will take a little root. In the fall cut those off, and in the spring plant them in nursery rows.

Ques. What are the qualities of the Moore's Ruby?

Ans. It is one of those new varieties that none of us know very much about. I know that it originated with Jacob Moore, of Brighton, N. Y., but I know nothing about it myself, only as I have seen the samples of fruit. It is of the Fay type, not quite as large a berry but a little better bunch, perhaps.

Ques. What can you tell us about the Prince Albert?

Ans. It is another one of the newer varieties that is not generally grown. I think it originated in Indiana, and I believe it is grown a little in Central and Western New York, but I know nothing about it from experience. Mr. Willard of Geneva thinks very highly of it. It is a good grower and a good bearer but of a poor quality.

Ques. What about the Long Branch Holland?

Ans. It is fair, but not so good as the Victoria in any way. A good many nursery men put this out for the Fay.

Ques. What are you raising for a commercial strawberry now?

Ans. I am planting more of the Greenville than anything else. The Greenville, Bubach, Lovett and Princess I am planting most extensively. I have 25 acres in commercial fields and those varieties predominate. Then I have many other varieties in test lots.

Ques. Have you tried the Marshall?

Ans. I have. It is a vigorous growing plant with heavy foliage, but it is rusting and it is not a safe plant to put out. It grows some large berries of good quality but not in great quantity. I paid ten dollars a dozen for the plants that I bought, and I have several thousand now that

I would like to sell for ten cents a dozen. I would not advise anybody to take them at that price. I do not think the Marshall is going to be a success.

Ques. Is the tree currant a success?

Ans. No, sir. One of the troubles of currant culture is the currant borer. If you have grown a single stem and that is bored and killed your jig is up for that bush. But if you have them in bush form the killing of a single cane will not hurt your bush. The tree currant is nothing but an ordinary cane made to grow tall by cutting off the buds. It is a mighty taking name and the tree agents get a big price for it. When you can buy currant bushes at fifty cents a dozen they can sell a tree currant for a dollar a tree. The tree currant is a little novelty, but I think there is no advantage in gathering the fruit.

Ques. How do you deal with worms?

Ans. I give the bushes one or two dustings with dry hellebore, mixed with a little plaster.

Ques. How do you apply it?

Ans. With one of those dusters that are made for that purpose.

Ques. Have you ever had any experience with the fly that lays its eggs in the currants causing them to drop?

Ans. I have not. I have heard of it in some sections.

Prof. HARVEY. This is a serious pest in Southern Maine. It begins with the larger ones, stinging them on the upper end, and continues to sting as long as they last.

Prof. HARVEY. I spent a whole week last year on the head waters of the Kennebec about Jackman, and all through that region I did not see a single blackberry. I found on the mountain region over towards Sandy bay some blackberry bushes, but not the high bush blackberry common in the southern section of Maine,—another variety of blackberry. I do not know the reason for this unless it is that the high bush blackberry is a more southern species,—its natural habitat is further south. I can see no reason in the soil or anything of that kind, to account for its not growing in Aroostook county, but simply in the fact that it is a species of plant that reaches its northern limit. It is not an arctic plant, but belongs to the New England flora.

Ques. Are there any better varieties of the blackberry than the Agawam and Snyder?

Ans. Not for this lattitude. The Agawam is one of the most hardy varieties for New England. The berries are medium in size, and it is one of the best blackberries for table use. Very large berries are showy but of inferior quality, having a large core in the center.

Ques. How many strawberries did you ever sell in any one year and how much did you get for them?

Ans. I never keep run of the amount of money I get, it varies with the year. Sometimes I will get four or five or six thousand dollars, and again not as many hundred. The yield varies from fifty bushels in a dry season up to 150 or 200 bushels. The greatest drawback to successful strawberry culture is the lack of moisture just at the time when the crop is in fruitage. You may cultivate the plant through the whole year, and have it blossom and set the green fruit and the fruit begin to mature, and then in the two or three weeks in which it is maturing if water is withheld you may lose half or two-thirds of what the yield might be if liberally supplied with water. The strawberry needs a liberal supply of water. On this account this past fall I have been building a system of water supply for the purpose of irrigation and now have between fifty and sixty acres that I can irrigate thoroughly. So I will never have any more trouble with short strawberry crops on account of lack of moisture.

Ques. Is there any danger of strawberries getting too much water? Will it do to put them on low, moist ground?

Ans. Strawberries do not like wet feet any more than you and I do. No plant will thrive well with wet feet. The strawberry wants well drained soil, and a liberal supply of moisture working through it. It will thrive on low ground well under-drained. On some of our deep, moist valley soil certain varieties do wonderfully well, but you need the drainage, you do not want soaked ground.

Mr. ALLEN. Mr. Fitz in Washington county told me that they wrote him from Boston and offered him twenty-two cents a basket net for his berries, and quite a number of the growers in that section availed themselves of that offer and sent their berries to Boston and got this price for them. One man received $1,500 net. The berry was this Quoddy Belle, said to have originated on Quoddy Head, a large berry with a nice color and fine flavor. I have been taking some interest in this berry, and have got the names of some of the growers, but have not had time as yet to get at any facts relative to it. I think it must be a variety that came from some other place and sort of drifted into that name, although it may have originated there. I think it must be a very fine berry because the Boston market catered to it in enormous quantities this year. If you can grow that berry here in Aroostook county and ship it to Boston, as you have a through line, there is almost no end to the money that you can get out of your berries. There are possibilities to you here in Aroostook county that we haven't in any other section of the State, except possibly the eastern section; and if you can get hold of the right end of the string and take hold of it in a business way I believe that those who are situated so that they can grow strawberries will find it greatly to their benefit to do so, and that it will bring pleasure to their homes. It is a grand crop to handle. You will find the growing of late varieties of strawberries for the Portland or Boston markets one of the best things you can engage in.

HON. LLEWELLYN POWERS. I came in here to listen and not to speak, and I confess that I have been very much edified. I think that the gentleman has given instruction that must be beneficial and valuable, and I could only wish that a larger number of our people from the southern and central part of Aroostook county had been present to listen to him.

We all know this—that if we would continue the prosperity that we have had during the past ten or twenty years we must diversify our crops. There is something wrong here in Aroostook county when you are selling a barrel of potatoes at forty or fifty cents, and paying the same amount for a peck of apples. We want to change that, and we want, so far as we can in this county, to diversify our crops. There are some things about this small fruit culture that perhaps you and I understand better than those who have not been here and spent years with us. In regard to having an abundance for our own use, I think we have quite an abundance of it now throughout the county. We do not raise very many of what we call cultivated strawberries, but throughout all of our fields in the southern part of the county we can go any day and get the most delicious of field strawberries, in their season, and they can be bought for ten cents a quart in abundance. I like them better than any cultivated ones that I have been able to get. But we never have been able to do anything sending those away. We have no market this side of Boston, and I have never known of anything being done in shipping them. So far as the raspberry is concerned, there is no part of the world in which it grows wild so large and bountifully, and with so good a flavor, as in this county. For several weeks in the summer you cannot ride out on our roads but you can get out and pick all you want almost anywhere, and as has been said we ship them by the carloads. But we have to ship them so long a distance that we can only sell them for making raspberry wine. I have seen the cultivated raspberry in Massachusetts, and I think that I have never seen the red raspberry growing any better or larger than on a great many bushes here in this county.

As to the blackberry, there are not many of them in our county, but I can think of places near Houlton where I can find quite a number of wild bushes bearing blackberries. I have never seen better cultivated blackberries than on the farm of Senator Nutter.

I am confident that we can cultivate these small fruits here, but the difficulty that stands in the way of most of our people, for we have not accumulated capital, is that we must have ready returns, and be sure of returns. The market for strawberries is far off, and if we get them into the market they go in late. While strawberries from the south which are poor, green things will sell, coming so early, yet if you put that same kind into the market and have it last I do not think it will sell at all. The gentleman says truly that the strawberry is something that is wanted all the year around, but I would rather have my crop go into the market first than last.

These remarks apply simply to Aroostook county; the climatic conditions are somewhat different in the center of the State. I have only known one or two years in which tomatoes would ripen here, but they will ripen in Somerset county. One reason may be that we are much higher, and cold depends, especially in the night time, quite as much upon height as it does upon latitude. We have cool nights always, that is why we grow such large crops of potatoes and grain. The rust does not trouble them.

I have no doubt that we might be able to raise some varieties of strawberries and ship them and make much more money than we are making to-day, and I hope that some one will try it. My opinion is that certain other fruits, like these apples here, would not grow as well here as in other parts of the State. I think that while we have a very excellent soil for the growing of strawberries, it is a different soil from that in the valley of the Connecticut. My recollection of that soil is that it is of a sandy character, a granite formation the same as in the central part of our State, while our soil here is a limestone shale formation, from the geological standpoint.

Expressing a wish and hope that all here will profit by this meeting, and expressing my gratitude to the gentleman from Connecticut, I will simply say that I am very glad to be here. I came to listen and I have felt fully repaid for coming.

RAISING FRUIT FOR PROFIT.

By CHARLES E. WHEELER, Chesterville.

I do not believe it is possible for a man to start in on orcharding and make a success of it unless he has some faith in the business and a good deal of faith in himself. You must have some stick-to-itiveness to succeed in growing apples. It is different from planting a crop of potatoes. With potatoes you plant to-day and in a few weeks harvest your crop. With apples you plant perhaps for others to reap. Still men who are much older than myself have planted orchards and are to-day receiving good returns for their labors. One gentleman in my county, perhaps as old as any one there is here, who has the largest orchard in the State of Maine, is still setting out trees. He commenced years ago, and people thought that he was foolish, for those trees would never pay him; but they are paying him to-day and it may be that he will live, even, to pick the apples from trees that have been set within a very few years. Here in this county you have a soil, it seems to me, upon these hardwood ridges, that is peculiarly adapted to the growing of fruit trees. We say that good, strong corn soil is good orchard land. Those high elevations or swells of land in the western part of the State are adapted to the growing of an orchard. Are not these hardwood swells of Aroostook county just as well adapted to this purpose as those of other portions of the State? As far as the soil is concerned they are, I think. But when you come to the consideration of what kind of trees you will plant, the varieties selected will have to be different.

A few weeks ago in looking over some of the old reports of the Maine Board of Agriculture I saw in one of the reports a remark which I think was made by Goodale in talking on the subject of fruit growing, that Maine was too far north for profitable fruit growing. That was years ago; and I have heard old people in my section say that it was considered rather doubtful years ago if fruit could be raised in Maine. But to-day the hillsides of Franklin county are well covered with orchards, and they are paying. Years ago the Baldwin was considered rather a doubtful variety, but it is not considered so to-day. The best paying orchards that we have are of Baldwins. In the earlier times seedlings were used, but to-day it is grafted fruits for the markets; and it may be that in years to come some of the varieties which are being perfected here will pay you well. Why not be setting out those seedling trees, caring for them and growing them as the climatic changes take place with the felling of the trees and the clearing of the forest? Why will you not then be ready to have those trees retopped to some useful varieties which you have found to be a paying kind here in Aroostook? I think it may be well to start your orchard in that way. I would not advise any one to set out an orchard from kinds that you would purchase of a tree agent. You must have something that is peculiarly and particularly adapted to this Aroostook climate. Dudley's Winter is well adapted to it, and with some of the other kinds mixed in for cross fertilization, as was spoken of in the talk on small fruits last evening, may give you good returns. I know there are men in this county who are trying many varieties. One gentleman told me he had eighty-three varieties. If you will take the pains to go and see those who are experimenting upon this line of work you can soon find out which kinds are adapted to your farm or your location, and that will save you many dollars, perhaps many years, in growing your orchard.

I think the majority of the people who are setting trees in the western part of the State are setting them in the turf. You will find a few orchards that are cultivated, but a very few; and it is in some old fields or pastures that the most of the trees are set. I believe when a man is going to raise apples for commercial purposes, the best way is to take a good field and give it good care and cultivation, and set your trees there. And I will tell you from my personal experience how we have set out our orchard. We measured off our fields and set the trees in rows two rods apart each way. We dug a large, deep ditch (do not be afraid of getting it too large, you will not do that) throwing the dirt and turf on the upper side. Two men can work at the business better than one. In throwing the dirt on to the upper side you will find that it will work down a great deal easier if you are putting it in with a hoe or with your hands than it would if thrown on the lower side. If the hole is too deep dump your sods in the bottom. They will in time decompose and form a natural plant food for the young roots. Trees that are well set out have a good start. In the manuring of these young trees we never have used barn manures. We prefer some kind of commercial fertilizer. I have used muriate of potash and fine ground bone at different times with very good results. The trees seem to grow and thrive finely upon that kind of feed. The only great setback with me in the growing of a young orchard has been the amount of care that has been required to keep the borers out of those young trees. I do not know as you are troubled with borers here, but we are in our section; and from all those old trees that are in the pastures of some neighbor's lot that you cannot attend to, in which the borers seem to thrive well, they will come out and infest these young trees. We go over the trees twice a year, the latter part of May or the first of June and the last of October, and take them out. They are easily found and with a pen knife you can destroy them before they get inside of the bark to do much damage. That is the only pest that has ever troubled us, excepting that a very few trees that came out of one nursery were troubled with bark lice. For them we have used ashes in a misty morning before the foliage starts, just throwing the ashes into the tree. The bark being moist, the lice are destroyed. There may be something better in the way of spraying, but this has always worked well with us.

I think one of the best things for the protection or growth of a young tree the first year is to have it well mulched, using some coarse manure if you have it. Horse manure and straw seem to be well adapted to keeping the soil moist and keeping down the weeds. If you haven't this to spare use some coarse swale hay, or something that you can find in the pasture, brakes or the like. About the middle of August there is always spare time and plenty of such material can be cut and put into the barn to be used the first thing in the spring. I have practiced that and like it well, perhaps running it under the cows or horses. If you do not want to do that you can simply take it from the barn and put it around the trees. Some leave it in large heaps in the field, but we have generally put it into the barn; and running it under the cows or horses makes a better mulch than just the bare grass or weeds. I do not believe that just the bare wild grasses or the brakes that you get in the pasture are worth much as a plant food, but they serve to keep the soil moist, and the trees seem to thrive in a cool, moist soil; and they also keep the weeds down.

In our fields where the trees are set we have spread it on in the fall and plowed it under, putting it down where the young roots can feed upon it, and the trees show marked growth. They look as though they enjoyed feeding upon that kind of food. In some of the sections where trees have come up, (volunteer trees as we call them) we fence off an acre or two and put some hogs in. They will turn over the sod and break up the soil, and as far as you can see that piece of orchard you will see the rank green foliage, showing that something has been going on there. I do not believe it is particularly the voidings of those animals that does this, but the breaking up of the moss bound grass roots, the breaking up of the different parts of the plant food in the soil so that the trees can take hold of it. That has done the work rather than the manures that any creatures leave there. Good tillage is as good a thing in growing an orchard as it is in growing a corn crop. I have found that where I worked around the trees, even if I did not put on any fertilizer of any kind, those trees did far better than those which were just left alone with the bare mulch of manure and wild grasses. So I believe that cultivation is as good in the orchard as it is among your potatoes or your corn crops. You sometimes hear that it is unwise to plow an orchard, but how old must an orchard be when it is unwise to plow it? I have trees that have been set five or six years and we are plowing that orchard, turning all one way, and turning every foot of that land up snug to the trees. We think we can do this better with a pair of cattle than with horses, and with a good side-hill plow or swivel plow we turn every foot of the ground. Those trees showed marked growth last year and with a very light manuring. We planted it with corn, and I think that a crop like corn is far better adapted to an orchard than some of the grain crops. It leaves the soil in rather a better condition than simply sowing on some grain.

Protection with us means something—protection of the trees in the winter from mice. There are various ways in which we protect them. One that is practiced a great deal is heeling down the snow around the tree. As the snows come on we tread that snow down compactly and the mice hardly ever trouble the trees. Others put laths around the tree, cutting them four feet long, and making a box right around the tree, tying it with small wire, the thirty-two steel wire that comes with small bobbins. That protects the tree from the mice and we have never lost any trees with that method. Some use tarred paper, but it is more of a job to get it on and it is more difficult to keep it over for the second year. Putting it on the second time is quite a job. The laths can be easily taken off and put away and put on the second or third time. In fact I do not know why they will not last a lifetime, almost, if you keep them properly housed. I do not know as there is any particular need of tying those laths on with more than one strand of wire. The first year we used wire at the bottom and a string at the top, but later on we have put the laths on earlier in the season and pounded the bottom of the laths down into the soil and simply tied the top. We used the wire because someone had used wool twine, or lighter twine, and the mice had gnawed it off so that it had broken and the sticks tumbled down. And as this farm that we were cultivating was a back farm where we do not go very often in the winter or late fall, we used this small steel wire. It is cheap and we feel as if it were surer than a string.

DISCUSSION.

Mr. HALE. I think this whole subject of apple culture is one of very great importance. These questions as to the plowing and methods of culture of course might be local questions very largely, but on general principles where culture can take place I certainly agree that level culture is the best. If our friend here has a field which needs dead furrows between the trees at certain distances each way, that land is too wet to plant an apple orchard on anyway. In regard to backing the furrows up to the tree to give the tree nutrition. I would just as soon think of standing in a plate of soup and hoping to absorb food that way, as to think of getting nutrition into an apple tree right at the base of the tree. I put my plant food out in the middle of the row, where this dead furrow would be, and the roots go out there and feed upon it. I do not think they absorb food just at the base of the tree very much.

All these questions of cultivating the orchard, of plowing or not plowing or plowing with a side-hill plow are local questions. It depends upon the character and condition of your soil. A thorough culture of some kind is needed; shallow culture and level culture will bring the best results. If you have a rocky hillside you must adapt yourself to the situation, and feed the tree from the top; let food and mulch take the place of cultivation. But where it is possible to cultivate there is nothing that will equal cultivation. It stimulates a vigorous, healthy growth. Where the very best of culture is given you have a vigorous growth, a tree or plant that is less susceptible to disease than it would otherwise be. I believe the apple question is one of great importance. The apple tree planting of New England is not beginning to keep pace with the consumption of apples, and there is no better opportunity for a sure, safe income for the New England farmer where the soil and climatic conditions are suitable, than to plant a large, permanent apple orchard of winter apples. I believe it is the largest industry that is open to us to-day. You have no idea of how the apple consumption is increasing, to say nothing of the export trade. There are a few large orchards in New England but there are more old trees than young ones. There are but few well cared for orchards. I have a friend away down in New Mexico who is urging me to come down and help him plant apple trees, and he hopes to sell half of his apples in New England; and he cannot begin to grow as fine colored or flavored apples as you can in many sections in Maine. I believe you can get rich in Maine by growing apples at $1 a barrel, but you must do it on a business basis. Plant large orchards, feed liberally, cultivate thoroughly, spray and thin your fruit every year.

They talk about off years in apple culture. There never ought to be an off year with an apple tree unless it is in the hands of an off man. Once in a while climatic conditions may kill the buds, but there is no reason why a tree should bear one year and not the next. Judicious bearing every year is the natural condition of the tree; but if you let it over bear one year, and do not let it have nutrition enough to develop that fruit and the germ life of the new fruit it does not make any new buds for the next year. But the next year it has time to make the buds for the following year, and so it goes, steady by jerks. It is just as essential to thin the apple as it is to thin the peach. You find the finest peaches, pears or plums on the market are from trees where the fruit has been thinned. And if you want a fine crop of apples every year you must thin the fruit from the time the tree begins to bear. If a tree when it begins to bear wants to produce twenty-five apples do not let it produce more than five; the next year if it would produce fifty, let it produce but twenty; and the next year if it would produce 200, let it produce only fifty. Then yon have left vitality in the tree for future years.

RAISING APPLES FOR PROFIT.

By CHARLES S. POPE, Manchester.

In former years the raising of apples was considered of secondary importance, or more properly speaking, what was obtained for apples was considered clear gain, as very little was expended in the orchard, it being left to care for itself. When the land was first cleared and the soil was rich in humus and potash, before we were troubled with the myriads of insects and diseases, the orchardists received a good crop without any extra effort, but under present conditions, if the trees are treated as in former years, or I should say, neglected as they generally were, a good crop is obtained only when all conditions are favorable. In such a season the country is flooded with apples, the price is low, and the profit correspondingly small.

There is a general complaint throughout the country that the apple is not as productive as in former years, and it behooves us to make a special study of the conditions which obtain at the present time, if we expect to raise apples with profit.

No farmer would expect to raise a crop of corn or potatoes on the same land, year after year, without the addition of some fertilizer. Have we done the same in the orchard?

Fifty years ago A. J. Downing claimed that it would amply repay the farmer if he wished the trees to continue in a healthy bearing condition, to manure them as regularly as any other crop.

The farmer has succeeded so well in raising apples without care or expense that he cannot see the necessity for tillage in the orchard, and yet it is plain that under proper conditions the best results can be obtained by this method. I would not advise putting the plow into an old neglected orchard where the roots are near the surface, but where cultivation is commenced as soon as the trees are set and continued every year, the roots are forced so low that they are not reached by the plow and therefore are not injured.

Much of our land which is adapted to apple growing is too rough and rocky for tillage, but we must remember that here we should make the conditions as near as possible like those in the tilled land.

The apple tree makes most of its growth in the early part of the season and if the orchard is in sod, the heavy growth of grass in June carries off a large portion of moisture and the roots which nearly all run near the surface, suffer for water; this means also suffering for food which can be obtained only through this medium. Suppose you visit your neighbor's barn and find his cows suffering with disease, covered with lice, furnished with a small quantity of hay and half of this stolen by the sheep and colts, running loose in the tie-up. Although at times the water supply is short these trespassers will take the lion's share. The owner appears and says he is getting very little income from his cows and declares in vigorous language, that there is no money in dairying. Would you not laugh in his face or to spare his feelings, change the subject? Look at home. In the treatment of your orchard are you not making the same mistake? Probably not one orchard in ten has half the food it really needs and the grass is taking a large share of this, together with the moisture which the tree can ill afford to spare during our summer drouths. It is a parallel case and we would do well to study it. In most soils we do not believe it possible to obtain good returns from the orchard and at the same time carry off a heavy crop of grass each year. Much better would it be to keep the grass very short with sheep, or still better by allowing the pigs to destroy the entire turf and work in a little fertilizer each year. A heavy mulch, sufficient to kill the grass might be preferred, if enough could be obtained. Few people are aware how far the roots extend and are apt to be satisfied with covering a small surface beneath the tree. It is frequently said that the roots of trees extend as far as the top, when in fact in good soil they extend twice as far, and in poor soil they run much longer distances in search of food. As the roots run so much deeper in the well cultivated soil it is at once apparent that in cases of severe drouth such trees will suffer less than those which are mulched in the manner which is commonly practiced.

Where the land is plowed and the surface frequently stirred, the roots are far below the surface, and with the mulch of loose, dry soil to prevent the waste of moisture we have the most perfect condition attainable. It is not necessary that the trees should occupy the whole ground while small, but it will be better for the land to be covered with some crop like beans or peas if the ground is stirred often between the rows and sufficient fertilizer is used for the support of both plants and trees.

Few people are aware of the amount of fertilizing material needed in the bearing orchard. It has been shown by careful experimenting that much more is required than for a crop of wheat. An acre of orcharding in full bearing will take annually from $15 to $25 worth of fertilizer from the soil.

If the trees fail to give good returns after being well fed, let us look further. First, to destroy the insect enemies. The bark louse, the bud moth, the leaf roller, the borers, and some others cannot be kept in check simply by the asking. While the fungus diseases which are doing so much damage in a moist season will still continue to ruin the fruit of those who will not take the pains to apply some remedy.

The advent of the spraying pump will, no doubt, prove to be a great boon to the progressive orchardist, and while insects and diseases will ruin the fruit of the neglegent, they will serve to clear the market, and those who have choice apples will be well repaid for the extra trouble required to keep them free from their enemies. It is impossible to tell in the early part of the season whether the fruit is likely to be injured by the apple scab, but we should spray as a matter of insurance for the scab, and it will not all be lost time, as we can add the arsenites at the proper time for the insects which like the poor "we always have with us."

We think one of the greatest obstacles to any immediate improvement, lies in the fact that too many of our orchardists cannot see the need of any radical change in their orchard management. They do not have faith enough in the methods which are now recommended to expend the time and money required and are satisfied with too small returns. If they decide to try a little experimenting it is in a half-hearted way, and this particularly in the matter of spraying for the apple scab. Squirting a little Bordeaux mixture once or twice during the season, without reference to time or manner will be of no perceptible benefit and many an orchardist has condemned the whole thing as a humbug after a little experience of this kind.

Much in the same line is the fertilizing where the manure is piled around the trunk of the tree and mulching which is kept in close quarters for fear of killing too much grass and thus shortening the hay crop.

Now I would not have the orchardist think that spraying, even in a thorough manner, is the only requisite for perfect fruit. The tree must first be furnished with plenty of food and the ground kept in good condition. Supplement this with spraying, using the proper mixtures at the right time, in a thorough manner and he can be as sure of good returns as from any crop that is raised on the farm. Greater care should be taken in the selection of varieties. Not only to take varieties suited to soil and location but to discard nearly all the new varieties which are not known in the market. Buyers pay the best prices for the old standards.

It is now believed by those who have made investigations that the blossoms of certain varieties of apple need to be fertilized with pollen from some other variety to give a full crop, and when the Bellflower, Spy, King, Talman Sweet and some other varieties which are more or less self sterile. are planted, some other varieties should be planted in the immediate neighborhood, to furnish pollen.

Do I hear some one ask, Can we, with all the labor which is now necessary to grow good fruit, compete successfully with other sections where the soil is rich and the trees grow rapidly and come into bearing early? Let us look at both sides of the question. Do we not possess some advantages? On the rich prairie soil whole orchards are frequently killed by the sudden changes of temperature in winter, and even as far north as New York, the chief difficulty in raising fruit is the late spring frosts, which destroy the crop, added to this, a price so low in seasons of plenty that they are allowed to rot on the trees, in some sections.

The risk from spring frosts in Maine is so slight that few people ever consider it a possible factor when planting fruit trees, and for the past thirty years, good apples have never lacked for a market at double the price it costs for picking and marketing. Take notice. I said good fruit and this is what I am urging upon our orchardists, that in the better care of the orchard, fertilizing, pruning and spraying together with more care in picking, sorting and marketing, lies the secret of money making in the orchard. The solution of the problem is not to see how much can be gathered from our trees without giving anything in return, but rather how great expenditure of time, money, and generous intelligent care can be made profitable.

DISCUSSION.

Mr. HALE. The subject of this paper by the ex-president of the society is of great importance. We farmers and land owners generally put too much stress, however, upon the mere matter of production. It is one thing to produce a crop, it is another thing to sell it. We farmers and land owners perforce of circumstances are capitalists, laborers and business men all combined. Nine-tenths of us forget that we are anything else but laborers. We work too hard and think and plan too little. We have capital invested in our business, and we put labor on top of the capital; and if we have put brains to work with it we get good results. When we get good apples we are only half-way along the road to success. The business man's end of selling them is a big end. We should study first what the markets want, not what some tree agents tells us we want; and as a rule it is big, red apples. And you will find out, as Mr. Pope has found out, that the highest prices are paid for the fruit that reaches the market in the finest order. They pay for style, weight and honest packing all the way through. Then find a commission man who appreciates that kind of goods. Well grown and well packed fruit is half the battle; then put in the hands of the right man in the right market at the right time and it brings the dollars. Apples may be produced for fifty cents a barrel. The question whether you sell them at fifty cents or three dollars a barrel lies very largely with yourself. If you produce fifty cent apples you will find somebody that will take them. If you produce three dollar apples you will find somebody that wants them. When the market breaks it is the low grade goods that hang fire and sell slowly. The high grade ones always command a good price.

I do certainly believe that commercial orchards of good, red winter apples, varieties that suit your locality and your soil would be a source of great profit to you. You cannot raise the Baldwin or Southern Beauty, but there are some varieties that you can raise. I have said since I came into the hall that I would have a hundred acre orchard of the Dudley's Winter or my name would be something else besides Hale. I believe if some of you farmers here who have 100 or 200 acres of good land would have the gimp to plant 100 acres to apples they would call you bloated bondholders, your profits would be so great from that orchard. But do not do it unless you like apples and like trees. If you love potatoes and would rather pick up potatoes than apples, keep on with the potatoes, and you will probably make something out of them. But if you enjoy seeing a tree grow and enjoy handling fine fruit, you will not only get great fun but ten times as much money out of it. The greater quantity you grow the easier you can sell them. When you have a quantity you can afford to advertise and buyers will come to you, markets are opened to you, and things will go all right. You would have to test varieties, and find those that will stand your winters here and that will bear well, and then I believe they will bring you great returns. I would rather have a dollar invested in an apple orchard in the State of Maine planted on the principles laid down in this last paper than $3 in any commercial enterprise that you have in your State, and I sup-you have some that are paying 15 to 20 per cent dividends. If a good apple orchard handled on the right lines cannot be made to pay more than a 20 per cent dividend there is something wrong with the man,—not with the orchard.

Ques. Will Mr. Pope tell us how he fertilizes his orchard? He did not allude to that.

Ans. I am ashamed to say that we have not fertilized as we ought. We have not fertilized anywhere near up to the standard. In the first place we have not realized, until within a few years, just where we were and just what was needed, and we have kept on setting trees. We have put our money into enlarging the orchard instead of taking care of trees already set, until now we are orchard poor. I suppose we have the largest orchard in one block that there is in the State, but that is nothing to brag of. If we had the best orchard, the one bearing the most apples and raising the apples the cheapest, it would be something to boast of. Our best orchard land, unfortunately, is in a rough pasture. The fields are clear loam, so we were obliged to go into the rough, rocky pastures to get land suitable for an orchard. Here we cannot till as I would advise every one who has suitable land on well cleared ground to do. We are bringing the conditions as nearly as possible to this tilled soil. If you have a soil that can be tilled and can mulch the whole surface, of course using a proper amount of fertilizer, you have the best possible conditions. What shall we use for mulching? Very few of us can get enough of any material in the shape of straw, meadow hay, ferns or anything of that kind to mulch a large orchard. Let us take what is fully as good and perhaps a little better, a light, new soil. Therefore keep the soil stirred all the time, and you have your orchard in the best condition. And that reminds me of what a gentleman said who had a blackberry bush, and it came very dry, and he had grand fruit; while the blackberry bushes of his neighbors all about him were all dried up. Some one asked him how he kept his bush that way, if he had been turning on water. "No," he said, "I water it with a hoe." If you will keep your orchard watered with a hoe or a cultivator, keeping that loose, light surface free from weeds, you have a perfect condition so that the moisture is not passing off.

But to go back to the fertilizing, where the most of us fail is in lack of fertilizer. We skimmed the farm and carried it to the orchard until we hadn't much more to take off, and then the question was, what to put on. The superphosphates, commercial fertilizers, as we buy them in the market, have too much nitrogen for a bearing tree. Nitrogen, which is one of the most costly ingredients that we purchase, worth about seventeen cents a pound, is not needed in an orchard, or but very little of it is needed after the trees come into a bearing condition. Therefore it is foolish for us to pay out so much money for nitrogen when we want it for phosphoric acid and potash. We have bought mostly pure ground bone and muriate of potash, using what mulching we can get to kill the grass and keep the soil moist, and also keeping sheep in the orchard to keep the grass down. But we have obtained the best results in that part of the orchard which we have parted off and pastured with hogs. We spread on a fertilizer and turned the hogs in and let them do the plowing, as the ground was so rough that we could not plow it with horses. The hogs did it just as nearly perfect as we could ask for, turning over about three inches deep the whole surface. On one little section that we picked last fall, in which the hogs had run for two years, were young trees just coming into bearing, Tallman Sweet and Hubbardston Nonsuch trees that had not suffered from the scab the year before; and those little trees of Tallman Sweet were loaded with four and five barrels of as handsome fruit as you need look for. The Hubbardston Nonsuch trees were so loaded that we had to pick off half the fruit in August, and then were obliged to prop the trees. And the apples were magnificent apples, and brought us a handsome price in Boston.

If you commence this plowing when you ought, as soon as the trees are set, you can plow close up to the trunk. All you have to look out for is to keep from barking your trees. Plow shallow, four or five inches is all that is necessary, and keep plowing. Do not allow those larger roots to form up in the surface soil. In poor soil the roots run close to the top and extend long distances, and in a few years they will catch together. In five years the roots will lock together, in poor soil particularly. Keep your ground rich and the roots will not need to search so far for food. In experiments at the Experiment Station the soil was dug away and the roots watched, and it was found that with a tree that would extend about four feet, the roots would be off about eight feet, in rich soil. The roots of the same sized tree in poor soil would run about seven times as far as the top extends.

Ques. At what time do you prune?

Ans. I do not know but it is a little dangerous for me to say anything about that where there are so many opinions. Let us look right at the theory of the thing, commence right at the foundation of the growth of the tree. You plant the little seed, and the little rootlet runs down into the soil, and the little sprout comes up above the ground. The whole of the force has been supplied from the apple seed, but now the conditions are different. The rootlet begins to suck from the soil crude material, which is carried up to the top where it is decomposed, and assimilated by the leaf, and the sap supports the growth of the whole tree, root and all. The root does not grow of itself but must have its sap carried up to the top and decomposed and formed into food, for the root as well as the top. We must bear in mind the reciprocal action between the top and the root, and in pruning we must be careful not to destroy it. You want to prune just as little from the top as you can; form your top while the tree is young. It is impossible to always tell just how your top is growing, and you will not know when is the best time to cut it. If you cut in the growing season, when the tree is full in life, you are throwing away just so much of your machinery, which is needed for the growth of your root and top, and you have checked the growth of the tree. Therefore prune in the dormant state. After the tree stops its growth in the fall remove the limbs that it is absolutely necessary to remove, and then you are doing less damage than at any other time. Then in the spring the sap flows up into the remaining limbs, and you get a larger growth than you would before you cut those away. But if you prune in full life you have checked the growth of the tree, and caused it to form more fruit buds. Therefore to check the growth and get more fruit buds prune in full life; for growth, prune in the dormant state, in the fall or before the buds begin to swell in the spring.

Remark. There is one thought that Mr. Pope usually brings out that he did not give you to-day, and that is in relation to thinning the fruit. It seemed to me to be very important to know that he got about the same quantity of fruit and very much larger fruit than he would have without thinning, and also spared his tree fully one-half, we might say, because the large amount of nourishment that it takes to develop the seed takes the strength out of the tree. So you see if the tree has to develop only one-half as much seed you gain that strength in your tree. Mr. Hale brought up the point that the tree should bear every year. It will do this if you do not let your tree get so weak that it cannot set fruit buds. I have had trees that were in the habit of bearing fruit every other year, and by giving them thorough cultivation and thinning the fruit judiciously they commenced to bear every year; and I believe we can accomplish that to a greater or less extent by carefully thinning the fruit and not allowing the tree to over-bear and get in a weakened condition. We may not get large crops every year, but the prospect is that we will get a crop of apples every year. I think we ought to consider that point.

Mr. Pope. I wanted to stir these people up a little, and let them study up the subject. We cannot remember to bring up all the little points, but we want to get them to study for themselves, to read for themselves, using judgment on what they read and discarding what is worthless.

The apple is about all water except the seed. The seed is what draws on the soil for potash and phosphoric acid; therefore as the gentleman says, when you pick off one-half the crop you have relieved the tree to that extent, and the vitality is not injured as it is when the tree is overloaded. If you have picked off half of the fruit the other half will be so much larger that you are getting about as many barrels of choice fruit as you would have had barrels of No. 2, and at the same time you have relieved the tree so that it is able to set the buds and bear fruit the next year. All of the Massachusetts plum and peach growers never think of such a thing as allowing a tree to overbear. Neither should we with our apple trees. It does not take much longer to pick the apples in August than it would in October. If your trees are in the soil that they should be they will overbear nearly every year; then keep them judiciously thinned and you will get the best results.

Ques. In planting seeds will you get the same kind of apples? If you plant a seed from a Russet apple will you get a tree that will bear a Russet apple or something different?

Ans. It is very seldom that you will get anything like the seed that is planted. There are certain varieties that seem to come up nearer true, and will show some of the characteristics of the apple from which the seed was taken, but these are very few. You would be about as likely to get a sweet red apple from a Russet as you would be to get one resembling the Russet. There is no dependence at all to be put on the seed. The old catalogued High Top Sweet raised largely through Kennebec county is an exception. I have seen whole orchards raised from the seed, and every tree was the old High Top Sweet, almost exactly like it. But there are very few kinds like this.

Ques. At what age of the apple would you thin it?

Ans. I would thin it as early as I could. When the tree is covered with these little apples you do not realize how large they are going to be and you do not see the necessity of thinning until they get nearly half grown. Any time before the seed gets thoroughly formed will do, and it is just as well to put it off until the apples are quite large because you can then pick off your wormy ones and small ones. We have thinned generally about the last of July or the first of August.

Ques. Would thinning on a young tree have any tendency to make the fruit drop in years to come?

Ans. I cannot see any reason why it should have that effect.

Ques. Wouldn't they pick rather hard at the time you thin them?

Ans. They pick a little harder than in the fall.

Ques. Wouldn't you be more liable to break the whole end of the limb?

Ans. You would be more liable to do this, but with most varieties there are fruit spurs enough left. There are kinds that are shy bearers, and they do not need thinning. But with varieties like the Baldwin or Hubbardston Nonsuch if you break a few spurs there will be enough left.

THE CODLIN MOTH, BORERS AND CURCULIO.

A DISCUSSION.

Prof. HARVEY. Mr. Pope has had a good deal of experience in spraying for this codlin moth. Will you tell us, Mr. Pope, at what time you spray?

Mr. POPE. Just as soon as the petals drop, when the calyx is open.

Prof, HARVEY. These codlin moths of course show themselves very much more prominently in a sparse bearing year. Mr. Whittier, the largest Baldwin grower in the State, said he thought sometimes they were beneficial as they helped him thin the fruit in a year when the trees were too full. But I do not think that is the way to look at it. If you allow them to make their inroads when the fruit is plentiful you increase their numbers, so that the next season if it is an off year you have a great many more of them and almost all of the apples will be infested. It is generally in the off year that the apples bring a better price, and that year these moths will do the most damage. If you spray every year and keep them back and thin your orchards by hand you will keep these insects in check, and have, from year to year, better results.

Mr. POPE. It is the eating of the canker worm, leaving the skeleton of the leaves, which makes the tree look brown.

Prof. HARVEY. It is not the winged stage of the codlin moth but the caterpillar stage that damages apples. In the caterpillar stage it has a mouth adapted for gnawing, and a stomach that nearly fills the body and runs the whole length of it. The moth, so far as I know, would suck nothing from the fruits, but, like butterflies, live on the sweets from flowers; in fact, a good many moths have no mouth at all. They are born for the simple purpose of laying eggs and nature has not given them even the privilege of a good meal. They live only long enough to lay eggs. In the case of the canker worm the female is not provided with wings, while the male is. That very fact,—that the female insect which lays the eggs is not provided with wings, is a weak point that is taken advantage of in coping with it.

There are two species of borers that infest the apple trees of Maine,—two ordinary species and occasionally some others. The first one of those species is known as the round-headed apple-tree borer. You may know it readily by the two white stripes that run down the length of the body. This is an insect that comes around in the night. It loves darkness because its deeds are evil. As it does its work by night it is rarely seen. I have been in the State ten years, and I have not seen during that time (and I am looking out for insects) more than half a dozen specimens. And yet there is not an orchard, I presume, in Maine, but what is more or less infested with them. They hide in the day time and do their work by night. Mr. Pope, do you see many of the beetles?

Mr. POPE. I have never found more than two. And let me say that in some sections of this State the borers are never found.

Prof. HARVEY. It is an insect that infests the round wood in our swamps and the sugar pear; and these belong to the rose family, the same family to which the apple tree belongs. It also affects plum and pear trees; it seems to affect the woody tissue of plants belonging to the rose family.

In regard to the other stages in the life history of this insect, it lays its eggs usually near the base of the tree, down close to the ground, and lays them one, or sometimes two, in a place. Mr. Pope, by his study of these insects the last year or two in his orchard, is of the opinion that the insect bores a little into the bark and lays its eggs. The eggs very soon hatch, and the first year the worms work just beneath the bark in the sap wood. The next year they work more extensively into the sap wood, doing more damage. Then the third year they bore deep into the wood and upward and outward to the bark. In the fall they go back into the burrow, and then in the spring change into this resting stage and remain in that a short time, a few weeks, and then the beetle comes out. They bore out the bark so that just a thin layer of the bark is all that is left, and this beetle gnaws that out a little bit and escapes. Then the females lay their eggs again.

Now, then, let us see in what way we can cope with these insects. By examining the trees at the season when the eggs are laid, by learning where these eggs can be found about the base of trees, very soon a man will become so experienced that he can destroy them with a penknife without doing any harm to the tree. If they escape you the first season, then you will find that they throw out sawdust-like chippings from the mouth of the burrow and you can locate them by that. If you get them the second year you will not have to dig very deep, but if you wait until the close of the second year and then attempt to take them out you will have to tear the wood of the tree quite a good deal to pieces. The time to cope with this insect would be in the egg form. The eggs are near the surface and the insect has done no damage; and if you can get them at that time, by a close, careful watchfulness, you will be saved much trouble. I will ask Mr. Pope to tell you just how he manages them.

Mr. POPE. The egg is laid, generally, through the month of July, or the last of June. Prof. Harvey tells you that the best time to cope with the insect is in the egg stage, but a person has got to be considerably experienced to be able to find that little egg, especially if the bark is roughened a little. All the mark you will find on the tree is just a little slit in the bark, as if you should run the point of a penknife in a quarter of an inch. I think we must depend more on taking this just after it has hatched, in the worm stage, before it has actually done any damage, but just as it begins to throw out a thread of brown chippings. In some cases it will be only a little moisture at first, a little thread forced out through a tiny hole. They may have got just through the bark to the wood, and you will be more likely to find them than in the egg stage, until you get pretty expert. This is the time to take them; too many wait until they throw out the large chippings and have done a large amount of damage. I think it is the second season in which they do the most damage, working between the bark and the sap wood and cutting off the sap wood.

Prof. HARVEY. I meant that they did the most boring the third year. You know that the life of the tree, the circulation of the sap, is on the outside. The heart of the tree is practically useless. Trees grow by an annual layer of wood and the growth of each year is between the bark and the wood of the previous year. Of course any injury to that would do the most injury to the tree. The greatest damage would be done where the insect is working in the sap wood of the tree just beneath the bark.

Ques. Have you received Bulletin No. 11 from N. J., which speaks of some kind of a paste being spread on the trunk of the tree?

Ans. I have not received the Bulletin, but I know the point to which you refer, and that is this;—you can sometimes put a wash upon the outside of the tree, generally some alkaline wash, which is distasteful to those insects, and they will come around to your orchard and find the trees all covered over, and perhaps go over to your neighbor's trees and lay their eggs instead of laying them in yours.

Then, again, I have heard people in the State declare that they could prevent their trees from having the borers by putting some rough mittens on their hands and rubbing the trunk at certain seasons of the year, around the base of it. Now if Mr. Pope's observations are correct, that this insect lays its eggs in little holes or openings, you can see that those eggs would be entirely beyond the reach of any external rubbing. I have had persons declare to me that they could keep their orchards free from borers in that way, but I have fancied they were located in sections where there were no borers. Just how the eggs are laid, just how many, etc., are points that are not entirely cleared up yet. There are some points regarding this matter that need investigation. It is the general belief that the eggs are laid upon the outside of the trunk or in little crevices, and that the insects do not make a hole. We cannot take anything for granted in the study of these insects. What we want to do is to see one of those borers lay its egg and see exactly how it is done, just as I watched the fly as he punctured the skin of the apple. We must be very careful about these little points, because a great deal may depend upon them. To see one thing, and to see another thing, and put the two together, may not be sufficient, as there may be a step between those that will give an entirely different view of the subject.

There is another borer which I would like to call your attention to, which is called a flat-headed borer. This beetle, you see, has a copper color, with two or three brighter copper colored spots upon the surface. This borer is a day-flying insect. It loves the sunshine and you will find it about trees in the day time. It is a very wary insect and very hard to catch, taking to wing very quickly, and perhaps for that reason would not be noticed unless one was up to catching them. We generally catch them with a net or something of that kind. These borers prefer to lay their eggs in the trunk or in the branches of the tree instead of down at the base, and they seem to prefer to lay them in an injured spot in the tree or in trees that are a little off in health. Their method of work is much like that of the other borer. They get underneath the bark, and if there is any difference, they work more between the bark and the wood than the other one. Sometimes they will work way around the tree under the bark and cut the growing part entirely off, and destroy the tree. These only remain in the tree one season, and then gnaw upward and out to the bark. Their growth is much more rapid than that of the other insect. In some parts of Maine they are perhaps as abundant as the other borer, if not more so. I have had letters from parties stating that they had taken as many as fifteen out of a single tree. They are a little more difficult to cope with than the other kind because you don't know exactly where they are going to lay their eggs. The others lay their eggs at the bottom of the tree; these, higher up in the branches in weakened spots in the tree. This insect is a native of Maine also, and not only affects plants belonging to the rose family, but the box alder, and sometimes the maple and other forest trees, besides the pear, plum, cherry, etc. You can always tell the worm of this kind from that of the other. The round-headed apple-tree borer or worm is about the same size the whole length, while the flat-headed borer has a thick head and narrows very rapidly; the rest of the body is very much narrower.

The fourth insect that I was to call your attention to this afternoon is the curculio. It is more properly a plum insect, or in other words, it does more damage to the plum than to any of our other fruits. In the absence of plums it does more or less damage to apples. I am not able to find many apples in the exhibit here that are affected by this insect. I think I have one here, though I may be mistaken. It stings the apple and then somehow seems to poison it. The curculio makes a little half-moon shaped cut in the apple and then in this little flap lays its eggs. I have not been able to raise more than one or two of the curculio from eggs that were laid in apples. They do not seem to flourish well in apples. They will get about half their growth and then die. I tried to breed quite a number of them and out of the whole I only got one perfect beetle. I wanted to satisfy myself thoroughly as to whether it was the same species as the plum curculio.

Ques. Will they cause the apple to fall?

Ans. They will, yes, sir.

Ques. Do they go to the core?

Ans. They do not, it is simply a surface effect. I do not regard this curculio as a very bad apple insect, but it is a very bad plum insect. These insects have long snouts and their common name would be snout beetles. The head is prolonged into a sort of a snout and the antennæ of the insect are located upon the side of this snout. It is a small insect, but capable of doing quite a good deal of damage, especially to plums. I will say in regard to a remedy for these as an apple insect, that if when you are spraying for the codlin moth or apple scab, you should put some poisonous matter into the mixture at the proper time you would destroy them. In spraying for the apple scab one might, at the proper season when these insects are upon the wing, put some arsenical compound with the Bordeaux mixture and make a double spray, spraying for the fungus and these insects also.

Ques. Is it necessary to spray three times for the codlin moth?

Ans. I do not think it is customary to spray more than once or twice for the codlin moth. For the apple scab they spray several times with Bordeaux mixture. I know some have sprayed once, and then again in two or three weeks, covering the first and the last appearance of the insect, as they are on the wing for about two weeks. I think this would be a good idea.

Ques. How early do you spray first?

Ans. Just as the blossoms are dropping. And then if you should spray a little later, before the apple turns down, when it is about the size of a pea, you probably would get the most of them, although after the closing of the calyx you cannot get at the eggs. After the apples turn down it would do no good at all to spray. If you should spray to-day and there should immediately follow a heavy shower of rain, it would be a good idea to spray again. But the best way, if you can manage it, is to spray when there is no prospect of rain. But it would be better to spray at just the right time and take the chances of spraying again if a hard rain came immediately after.

PLUM CULTURE IN MAINE.

DISCUSSION.

Mr. VINTON. At a meeting of this Pomological Society held in Bangor which I attended, a Mr. Lowe of Bangor gave us a talk upon plums. He was then the most noted plum raiser in the State. I have tried to raise plums in all possible ways, and have failed and had to give it up. I was so interested in his talk that as soon as I could get at him privately I asked him why I could not raise plums. He said, "What kind of soil have you?" I described my soil as well as I could, and he said, "I see your difficulty; you cannot raise plums on that kind of soil; it is impossible. I have a soil that is peculiarly adapted to plum culture and that is really the secret of my success. There is but little such soil in Maine." What do you think about this?

Mr. LUCE. I think he was entirely mistaken. I think there is any quantity of soil in Maine on which plums can be grown.

Ques. Is there a kind of soil that is better adapted to growing plums than any other?

Ans. A clayey loam—not a heavy clay—is best for European varieties, but experience has proved that the Japanese plums, in particular, will grow on light soils. While I have all respect for Mr. Lowe, I think he was mistaken on this point. The soil of his plum orchard was clayey loam. I do not know how your soil is here, but we have thousands and thousands of acres of clayey loam in our section, and I do not see any trouble in raising plums. What is your soil, Mr. Vinton?

Mr. VINTON. My soil where I undertook to raise plums is a light soil, not exactly a sandy soil but a light loam soil. There is no clay anywhere near it that I ever knew of. Does the plum require clay?

Ans. The European varieties do best in clayey loam, and the European varieties were the ones you tried, I presume. I think if you should try some of the Japanese plums you would have no trouble in raising them. But do not be fooled with the Prunus Simoni. You can grow the tree but you cannot run the buds through; and if it did fruit I should not want it. We tested it and very soon decided that it was no good for us. It is one of the most beautiful fruits that you ever looked at, a very clear, handsome red with a purple bloom, a most delightful combination of colors.

Ques. Do you have any varieties that you lay down in the winter?

Ans. No, sir. I do not have to lay down any of the trees. My trees have grown very rank. I have one Bradshaw that was set in 1887, the largest tree I have that was set at that time, which I measured this year and it measured twenty-three inches in circumference and about seven inches in diameter.

Ques. What has been your experience with the Botan?

Ans. The Botan, as I understand it, is a class. The Abundance is the Sweet Botan; at least, it is claimed they are the same thing.

Mr. POPE. Pardon me if I just say that the plum that is sold mostly through our section as the Botan is the Botan No. 26. The Botan is a class, and this No. 26, which is now called the Willard, has been sold as the Botan.

Mr. LUCE. Different nurserymen have different ways of expressing the same thing. Each one likes to express it in his own way.

If I were going to set plum trees on a large scale I should send directly to Mr. Willard of Geneva, N. Y., and get the trees from him. He will not charge you more than $15 a hundred for yearling trees. We had Mr. Willard in our pomological meeting a few years ago, and I got acquainted with him. He is a great plum grower, he had 40,000 baskets of plums this year. He is one of the most enthusiastic fruit growers I ever saw; in fact, most of the fruit growers are enthusiastic, and those that are specialists are even more enthusiastic than those growing in a general way.

Ques. Is there any section of the State where laying the trees down is practiced except here in Aroostook county?

Ans. I know of no other section. It is not at all practiced with us.

Ques. Have you made any inquiry as to the necessity of laying them down here,—whether they will live without it?

Ans. I have. I was talking with Mr. Dudley this fall and he was speaking of a friend of his who had quite a large number of plum trees set out, and one fall he did not lay them down and they all died. In fact, a gentleman here spoke to me about setting some trees and not laying them down and the next year they were all dead. It seems a little singular to me that they will not thrive here standing.

The first Ogon that I ever saw of any size was down in Houlton in Mr. Merritt's nursery. It was in a very exposed location, and he had not protected it a particle. The leaf buds had never killed back at all, but the fruit buds had, because he told me this fall it was a very shy bearer and that is not a characteristic of the plum. It was sent him for experimental purposes, and this is his experience with it.

THE IMPORTANCE OF BIRDS.

By LEW. M. FELCH, Ricker Classical Institute.

Birds are of more importance than people are inclined to think. In our struggle to live, we are apt to treat lightly anything which we do not find producing wealth. But there are some things that cannot be measured by dollars and cents. Among these things, the birds that contribute so much to the beauty of field and wood and make sweet music, are among our most valued treasures. What is more beautiful than a living bird? We Americans need to have our appreciation of the beautiful quickened and trained, for where we enjoy a little we may by culture enjoy much. But the birds are useful as well as beautiful, and it is of this I purpose to speak.

It is said by a good authority that more than four-fifths of the animal kingdom are insects. Over four hundred thousand species have been studied to some extent and there are at least one hundred thousand more to be catalogued. It would take a large volume to contain the full titles of the books that have been written on entomology.

The beetles and grasshoppers alone cost the United States $100,000,000 yearly. Every tree has its insect enemies. Seventy-five species attack the apple tree. Twenty-five infest the elm. One hundred prey upon the pine. Over fifty species live upon the grains and grasses. Thirty attack the vegetable garden. More than five hundred species cut down the profits of the farmers and lumbermen every year. And there are new species constantly coming into notice. As our forests are cleared away, the natural food of some insects is taken away, and it is forced to adapt itself to new conditions. Often it thrives under the new conditions better than under the old.

While we are thus attacked by such an army we are also ignorant of the means of successfully repelling the invader. A few years ago the canker worm attacked the elms around our school, and stripped them of every leaf. The next spring we were to quite an expense to put tarred paper around the tree to keep the worm down. But there were enough eggs above the paper to again strip the trees. Had we known that the female is without wings and taken steps to kept her down in the fall, we could have successfully combatted the few worms that wanted to go up in the spring.

We are often asked, and sometimes ask ourselves, "Why did God make the insects?" They have their uses and we could ill afford to lose them. They carry the pollen from plant to plant. Without them many plants could not produce their seed. They are our scavengers. They furnish us with honey, silk, dyes, ink, medicine, etc. But did the Creator intend that they should destroy our crops and make life miserable? No, there was to be a balance of power, and things were to be kept equal by the birds.

There is not a bird warbles his songs in our fields or woods, but is the personal friend of the farmer. These song birds are social in their habits and are found in greatest numbers near human habitations. The so-called robin is one of our best friends. It is said that if a man could consume an animal diet equivalent to that of a good healthy robin, it would take a Bologna sausage nine inches in diameter and fifteen feet long to last him one day. The robin is surely one of the most industrious of our friends. The swallows, too, are ever on the wing with open bill to take in anything which comes in their way. Yet instead of welcoming the swallow as a friend, many farmers destroy their nests and eggs.

The woodpecker, or, as some call him, sap sucker, is looked upon with disfavor by many farmers. My father gave me a gun and directed me to watch the apple trees and shoot the woodpeckers. But instead of being an injury the best orchardists tell me he is a decided benefit, hunting out the harmful insects and in many ways benefiting the tree.

I wish to speak a word in favor of the blackbird. When the canker-worms were stripping the leaves from the elms, and spinning down upon the heads of the passerby, the blackbirds came to the rescue, and valiant service did they do. We looked, but looked in vain, for the English sparrow to come to the feast. The English sparrow in its own home may be a very useful bird, but in America he is nothing but a nuisance.

The birds are decreasing in numbers, and it is high time we looked for the cause. The bobolink, once so numerous in all our fields, is seldom seen. The Baltimore oriole is a very rare visitor in the State, and the dear little bluebird is not often seen. Why is this? Bird-nesting is one cause of the decrease in the number of birds. This should be frowned upon, as there is no need of the so-called "collections," as every bird and its egg has been studied and photographed.

There are some men and boys who go tramping around the country with more powder than brains, who shoot anything that has life to see how true their guns carry. There is a practice in some parts of the State of organizing a shooting match, when a lot of men start out and shoot everything that has life. The farmer should put his foot down, hard, on this pernicious practice, and stringent laws should be passed to punish offenders.

The ladies, too, are in a great measure responsible for the killing off of the birds. Millions of birdskins have been taken annually from some small sections of the country for ornamenting ladies' hats and bonnets. I am sure no woman who stops to think of the cruelty of this slaughter of parent birds would ever wear a birdskin upon her hat.

How shall we preserve the few that remain? By wise laws and by teaching the young the importance of birds, and the beauty of birds.

THE FOOD VALUE OF NUTS AND FRUITS.

By Anna Barrows, Boston.

Within a few years there has been a great deal written and said about the use of nuts as food and there is every reason to suppose that this interest will increase rather than diminish. The United States Department of Agriculture has issued a bulletin recently upon the cultivation and use of peanuts; and before long will send out another about nuts proper, for although similar in composition to the walnut, almond, etc., the peanut, or ground nut, belongs to a wholly different class of plants, the legumes.

Nuts are clean, wholesome food and afford little opportunity for adulteration. The only objection to their use for food is that, like cheese, they are over rich in nutriment, and hence indigestible unless eaten carefully. Fruits and nuts may therefore be combined to advantage, the one to dilute the other.

The early races of men undoubtedly made use of the fruits and nuts furnished by nature, even the bitter acorn served as a food. The degeneracy of the teeth of mankind in the present era has been ascribed to lack of exercise in cracking nuts.

The cocoanut palm furnishes the South Sea Islander with much food material, beside being useful to him in other ways. The fresh cocoanuts are brought to our markets at certain seasons of the year and the dried or dessicated preparations are much used in our sweetmeats. Now a preparation of the cocoanut oil is coming into competition with the animal fats.

All nuts are rich in fats and oils, which are expressed for many purposes beside use as food. Because of this richness nuts spoil easily unless carefully kept. Many varieties of nuts contain nearly fifty per cent of oil, hence are valuable as force-producing foods.

Too often, nuts are eaten after a substantial meal when they will do harm rather than good and their sustaining qualities have not been recognized. A traveler will do better often to feed upon nuts and fruit rather than the usual dishes furnished at the average railway station.

In northern New England we have not a great variety of nuts and little has yet been done to show how those we have will repay cultivation. Someone has said that as yet we have only those which grow in spite of the people. The hazel nut is sweet and well flavored and so is the beech nut; though it may seem as if either of these were too small to yield great rewards.

The oil nut or butter nut yields plentifully under adverse conditions. Combined with maple sugar it produces a confection unsurpassed by any higher priced sweetmeats and might thus be made profitable.

The walnut and pecan are abundant in some parts of our country and may be purchased at reasonable rates all shelled if desired.

The chestnut is not rich in fat like some of the other nuts and for that reason takes the place of starchy foods in the lands of southern Europe where it grows abundantly. It may be boiled and mashed like potatoes and made into croquettes or soup, or combined with eggs, cream and sugar for desserts.

The increased use of nuts and fruits as food would doubtless make the average family richer in health and the expense of such living is much less than when more meat is used.

We have not yet begun to learn the possibilities in the preservation of fruits, nor are we ready to admit that they have any real food value. We consider them as luxuries, rather than essentials on our tables. Nor have we fully grasped the important points in ordinary jelly-making and canning. Too often the housekeeper makes hard work of these processes and is not sure that the results of her labor will be successful.

Perhaps one reason that we have made so little progress in this direction is because fruits are such delicate articles and our implements have not been well adapted to dealing with them. Another difficulty lies in the variation in the substance of fruits at different stages of growth, and that this variable quality has been so little studied.

We have found in practical housekeeping that when any starchy compound is cooked for a long time it grows thinner and develops a sweet taste not present in the beginning. The pectin in fruits undergoes a similar change through the action of the sun's rays, and fruits which have not yet fully ripened may be similarly transformed by cooking.

Hence we may see that fully ripe fruit will not be the most desirable for jelly-making, but will have a syrup-like consistency after cooking. Some fruits contain so small a quantity of this principle that it is impossible to make jelly of them without the aid of gelatine.

If we are so unfortunate as to attempt to make jelly from over-ripe fruit and it refuses to become jelly, the best thing to do is to can the syrup and use it later to flavor pudding sauces, ice-creams, etc.

Nothing must be suffered to impair the delicious flavors of fruits. An accumulation of dust, mould and decayed portions, even if each be slight, cannot but affect the result. Therefore the fruit for any purpose must be carefully picked over and washed and any imperfect portions removed. Very juicy fruits, like currants, may have the juice expressed without first cooking, while others, like the crab apple, require the effect of heat.

The utensils for cooking and straining should not be of metal if the best flavors of the fruit are to be retained. Agate or granite ware kettles are preferable to the heavy iron ones lined with porcelain. Wooden spoons and linen strainers are also desirable for this work. If necessary to use metal anywhere, do it as quickly as possible. Never leave a metal spoon in a kettle of cooked fruit.

JELLY MAKING.

The fruit juice should be allowed to drip through the strainer, since pressing will bring pulp through also, which would make the jelly cloudy. A square of linen cheesecloth is a satisfactory strainer; the opposite corners may be tied together and hung over a rod placed on two supports at convenient distance from the dish beneath, into which the juice drips. Fruits having little pulp may be pressed through the linen strainer and then allowed to drip through a flannel bag. Only enough water should be used in cooking the fruit to keep it from burning, otherwise long boiling will be required after the juice is strained to evaporate the water added. If this is necessary, do it before adding the sugar.

The usual rule in making jelly from any kind of fruit is to use a pound of sugar for every pint of juice, but with a sweet fruit, or with one which is sure to jelly readily, less will be required. Only the best granulated sugar should be used. Brown sugar may do for some marmalades, but not for clear jellies. Granulated sugar is usually considered the cheapest form of sweetening; brown sugars are moister and not always pure.

Even if but a small quantity of jelly is to be made, a large kettle should be chosen rather than a small one, because it offers a greater surface for evaporation, and the quicker the jelly is made the better. Hence it is sometimes easier to prepare several small lots instead of one large quantity. Twenty minutes is the average time for boiling after the juice and sugar are put together and begin to boil, but as this depends on the condition of the fruit, and the shape of the kettle, it is safe to watch closely after ten minutes have passed. A thick white froth or scum usually appears on the surface and should be carefully removed before it is mixed with the jelly by the force of the boiling syrup. Some directions omit this caution, preferring to pass the jelly through a flannel bag again before putting in glasses, but that is unnecessary and undesirable, as it might harden and refuse to be strained.

It is not easy for a beginner to decide when the jelly is sufficiently cooked; the best tests are dependent upon close observation. A few drops on a cold surface will harden quickly if the jelly is done, or the change in texture will show on the spoon in stirring, or around the edge of the kettle. Over-cooked jelly will be of a gluey consistency, but if underdone the glasses may stand for a day in the sunlight, which will usually accomplish the desired result.

For jelly all sorts and conditions of receptacles may be utilized; goblets which cannot stand upright can be set in tin cans for support or have the base put into a block of wood, old sugar bowls, odd cups, bowls, mugs or pitchers, all may answer as well as the most approved jelly tumblers. This, of course, is for home use. For the market half the battle lies in the attractive shape in which it is put up.

Whatever the jelly is to be kept in, should stand in scalding water for some time before filling; this may be done before the boiling of the jelly begins, and the water be changed once meantime. There are several advantages in this treatment. The dishes are then not likely to crack when the hot jelly is put in them; as they are expanded by the heat and cool with the jelly, there will be little or no vacant space between them when both are cold. This thorough scalding will destroy, also, any germs which might have been on the dish, and would afterward develop in the jelly. A dense substance like jelly is always more easily preserved than fluid preparations of fruit, since bacteria cannot as easily work upon solid materials. But they may attack its outer surface, therefore we have devised various means of protecting our jelly tumblers from the air which might bring the germs or spores of moulds and ferments.

Some people cover the surface with a layer of fine sugar, a quarter of an inch deep, and then paste a paper over the edge of the glass. Others dip paper in alcohol, for the bacteria are sensible enough not to like that very well, and press this on top the jelly, with another paper over the glass. Sterilized cotton batting may take the place of one or both layers of paper. Yet another way is to wait until the jelly has hardened and is quite cold and then pour melted paraffine on top, let one layer cool, then pour on another, and cover with paper to keep dust out. When the jelly is to be used the parafine is easily removed and may be used over and over again.

MARMALADES.

This old-fashioned sweetmeat is seldom seen, since air-tight jars have come into general use, with the exception of orange marmalade, which is more like a jelly. In these confections we have the whole substance of the fruit, pulp as well as juice; or a part of the juice may be used for jelly and the remainder made into marmalade. A potato ricer can be used to sift the pulp, but great care must be taken when removing cores or seeds and skins or they will drop into the pulp, and a second sifting be required. When cold the cooked fruit will not sift as easily as when hot. It is often convenient to make jelly one day and sift the pulp and leave until another day before finishing the marmalade. Less sugar is required for this than for jelly, from one-half to three-fourths of a pound according to the fruit. This is such a thick, heavy mixture there is great danger that it will stick to the bottom of the kettle and burn, hence it must be stirred frequently. Here again the shallow kettle is best, for this process is especially one of evaporation. The marmadale should not be placed over too hot a fire, and an asbestos mat underneath will be a safe-guard. It may cook in this way for several hours; when done it will be considerably reduced in bulk and of a rich, dark color. The Aladdin oven is excellent for this process.

Apples, grapes, quinces, and any fruits having considerable solid substance as well as juice are best suited for marmalades. Like jellies, these will keep indefinitely if carefully put up. They may be as stiff or stiffer than jelly, or soft enough to dip with a spoon, but the latter comes more properly under the class of jams, or fruit butters.

A combination of fruits makes a delicious marmalade. Apple is perhaps the best basis and to it may be added quince, plums, or whatever fruit is at hand. In winter time several scraps of canned fruit may be put with some fresh apples and all slowly simmered till well blended into a new compound.

Solid marmalade may be cut in strips or cubes, rolled in sugar and left to dry slightly, and then will be an agreeable addition to a box of home-made candy.

PRESERVES.

The pound-for-pound preserves of our grandmothers were much like jellies or marmalades, but made of whole fruits without straining. There were no air-tight jars in those days, but long, gentle cooking evaporated much water and, with the large proportion of sugar, gave a result too rich for the micro-organisms to invade. There is no serious objection to this kind of sweetmeat, provided it is properly used. Of course, so large quantities should not be eaten as may be safe with the modern canned fruits. A little of this rich preserve is very nice to serve with light puddings, ices, or similar desserts. Even boiled rice, so often despised, will become a favorite if thus accompanied.

CANNING.

The invention of air-tight glass jars opened a new era in the preservation of fruits, but the early ones were often imperfect, and housekeepers did not at first know how to use them to the best advantage.

The best jars are those having glass covers and fastening with a spring. The screw tops are easily rendered imperfect and are hard to close and open. The less lettering there is in the glass the surer we are of keeping it clean. The rubber rings spoil quickly and none that are stretched or brittle should be used. A few new ones are usually required every year. Pint jars are more satisfactory for the average family than the larger sizes.

A grocer's tunnel is desirable for filling the jars, and a half-pint dipper with a long handle is another help. All parts of the jar should be thoroughly sterilized by the aid of boiling water; so should the tunnel and dipper, and anything else that may come in contact with the fruit.

Recipes are sometimes sold for preserving fruits by the use of salicylic acid. Though not absolutely poisonous, this is not advisable for steady diet, and is quite unnecessary if sufficient care is taken during the process.

The essential points in canning fruits may be summed up in very few words. All that is necessary is to have the fruit and everything that comes in contact with it sterilized, and then keep the air away from it. That is, the fruit and whatever it touches must be raised to a sufficient degree of heat to destroy any micro-organisms already there that would cause a change of form, or decay. This being done care must be taken that no others are allowed to enter through the air. There is no magic about it, only constant watchfulness.

Gentle cooking, long continued, rather than intense heat for a short period, seems to be most fatal to these tiny particles which might work so much ill. This method is also conducive to preserving the natural appearance of the fruit.

Some sugar is generally used in canning fruits, as then they are ready for table use. The quantity will, of course, vary with the amount of acid the different varieties contain. A half pound of sugar to a pound of fruit is a fair average, but some kinds do not need as much. The amount of water to be added will also vary, as some fruits are juicy enough to cook themselves. We gain nothing by canning water, it simply fills up our jars; better add a little to the fruit when the can is opened, as then the gases it contains will help to aerate and freshen the fruit. If, however, we have not quite enough to fill our jars we need not hesitate to add a spoonful or two more water.

Many housekeepers find it easier to can fruits in small lots than to devote whole days to the task. With a gas or kerosene stove a kettle of fruit is quickly heated and kept at the proper temperature, and a few jars may be attended to easily while other work is in progress without really taking much extra time. It is surprising to see how rapidly the shelves may be filled with jars by this method.

Few families have yet discovered what delicious compounds may be made by blending different fruits. Here is a field for future study.

RECIPES.

SAVORY CHESTNUTS—Scald one pint of shelled chestnuts and remove the brown skin. Boil for half an hour or until tender. Let the water evaporate or drain it off and chop or mash the nuts. Add one tablespoonful of butter, a few drops of onion juice and season with salt and pepper. Serve hot with meats in place of potatoes or rice.

CRANBERRY SAUCE—Use half as much sugar as cranberries and half as much water as sugar. Sprinkle the sugar over the berries in an earthen or granite kettle, pour in the water on one side. Cover until the sugar is dissolved and the syrup begins to boil. Then remove cover and press the berries into the syrup until all are broken. Then pour into moulds and it will be of a jelly-like consistency when cold.

CRANBERRIES WITH RAISINS—Use two parts cranberries to one part raisins, seedless or seeded. Cover the raisins with water and cook until nearly tender. Then add the cranberries and cook till the latter burst, then add a small quantity of sugar according to the sweetness of the raisins.

Fruit Farina—Into one pint of salted boiling water, sprinkle three tablespoonfuls of farina and cook for thirty minutes. When partly done add a small glass of apple, currant or cranberry jelly and mix smoothly. Pour into moulds and serve when cold with sugar and cream. Juice of fresh fruit can be used in place of water or instead of using jelly.

Apple Sponge—Cook three medium sized apples with the skins on, by baking, steaming or stewing. Sift the pulp, which should be as dry as possible, removing the skins. There will be about one cupful of the sifted pulp. While the pulp is hot, dissolve in it a level teaspoonful of granulated gelatine previously soaked in one-fourth cupful of cold water. Then add from one-fourth to one-half cupful of sugar according to the sourness of the apples, and a speck of salt. Beat the whites of three eggs until stiff and gradually beat into the apple mixture after it begins to stiffen. Put in moulds and when firm serve with a soft custard made with the yolks of the eggs.

Almond Custard—Scald one pint of milk and add to it one-fourth cupful almond paste. When that is softened add the beaten yolks of three eggs. Cook for two or three minutes till it thickens and add two table-spoonfuls of sugar. Cool quickly, add a bit of salt and a few drops of almond extract if desired.

SECRETARY'S PORTFOLIO.

Original and Selected Articles, having reference more or less to Fruits and Fruit Growers in Maine.

SECRETARY'S PORTFOLIO.

EPHRAIM W. BULL.

On the face of the hillside in old Concord stands the home of one whose name in recent years has often been grouped with the work of fruit growing in this country. There is nothing special to attract one in the appearance of the house, but a few years since as the writer was riding past with a friend, "There," said he, "is the home of the man who originated the Concord grape, and made known its value to the world." So it was, for here he lived many years and quietly did the great work which seemed to be allotted to him. Just how it came about it does not matter now, but somehow others won the profits that flowed to the introducer of the Concord grape, and to Mr. E. W. Bull, who raised the variety from seeds of his planting was given the fame alone. Perhaps this would seem of slight account had not Mr. Bull lived to an age when he actually needed the income his labors deserved. But in the struggle for wealth merit is often slighted. Perhaps in the unknown future such wrongs may be righted, if it is ever possible to make a wrong right. It is not for us to pass judgment, for in the great scheme of the Creator there are many things that finite creatures are entirely unable to explain, and it may be well that it is so. Mr. Bull was born in Boston in 1806 in a house on Washington street. A large garden surrounded the house, and it was here he began to study those things for which he afterwards became famous. By trade he became a gold beater, but he had very little heart in such an occupation, and about sixty years ago he removed to Concord, where he passed the remainder of his life. As the infirmities of life began to weigh upon him, in appreciation of his great service to horticulture, many were pleased to send him aid to make him comfortable in his old age. It was a pleasure to aid him, and the gifts were received with profound gratitude. His poverty was so great that it seemed best for him to enter a charitable institution, and here his last days were spent in peace and happiness.

A gentleman who was well acquainted with him writes this beautiful tribute to his memory:

"A beautiful old man has left his home in Concord, exchanging it, as we must think, for a better. A short time ago he met our deputy and replying pleasantly to congratulations upon his health, said: 'I have my work to do, and no one else can do it for me; I take good care of myself, so that I can stay and do it.'

"There is something very childlike, and at the same time beautifully Christian, about these words. Here was a man who had survived his generation by a great way, living a long while already upon borrowed time, and yet happy to think that the Lord might have more for him to do, and carefully husbanding his slender resources of vitality that he might have the pleasure of doing whatever more the Lord might have still remaining.

"One of the sweetest old people, we take it, in the town of Concord, for a long time was Mr. Bull. When it seemed as though he might be lonesome, and regretful, and anxious, none of these things moved him. His lot seemed to him beautiful, because he saw the beautiful that was in it. And so he moved among us a preacher of Christian faith, and revealing to us many of the sweetest things of life; a benefactor of the public; an invaluable citizen, an example to multitudes of us that are treading sometimes a weary way.

"Mr. Bull was the originator of the Concord grape. How much he has added in that capacity to the sum total of human welfare could not easily be told. Neither can we estimate how much he has added to the fair fame of the old town of which he was so proud."

S. R. SWEETSER.

We were pained to learn in the winter following our 1894 exhibition, of the serious illness of Mr. S. R. Sweetser, at his home in Cumberland Center. Although he had been in poor health for many years, this sickness proved to be his last. For many months loving friends watched by his bedside, ministered to his wants and cheered him by the tenderest words of love as the journey of life drew near its close. On the 10th of December, 1895, he passed away.

Mr. Sweetser was born in Cumberland, April 19, 1817. In accordance with the custom of that time, when a boy he was apprenticed to learn the shoemaker's trade, and for several years after he followed the trade. He also engaged in brickmaking a number of years. In 1849 he married Mary J. Pettie, and settled on the homestead, where he lived during the remainder of his life. There were born to them three children, two sons and a daughter. His wife died in 1879 and the daughter in 1890.

Mr. Fred R. Sweetser, one of his sons, has kindly furnished the Secretary with these data, and in his letter he adds:

"From my earliest recollection he was very much interested in fruit growing. He and his brother were the first to introduce several of the standard varieties of apples in this section. They procured scions of the same and grafted them on seedlings of their own growing.

"He became a life member of the State Pomological Society in its infancy, and one of his greatest pleasures was to attend their meetings.

"I think that he was well posted on apples, both as regards fruit and trees. His opinion was regarded as good authority. He frequently spoke to me of his friends in the Pomological Society which I think he loved next his own family.

"Although a man in poor health, he was always happy when working among his trees, or talking on this, his favorite subject, and he never lost his interest in it."

"The members of the Pomological Society held Mr. Sweetser in high esteem, and always found him a very genial companion, and just as eager to learn as to impart information to others. He was familiar with the best methods of culture and a careful student of the pests that affected his fruits. We think he was the first fruit grower in the State who made a study of the trypeta pomonella. He was most helpful to Professor Harvey in his study of this troublesome insect. He was a ready speaker and often joined in the discussions at our meetings. We shall always have the pleasantest recollection of Mr. Sweetser, and unite in tendering to the bereaved family our sympathy, and this expression of our regard for his memory.

AROOSTOOK SEEDLINGS.

At the Winter Meeting held in Presque Isle there were several interesting exhibits of Aroostook seedlings. The committee to whom these were referred for examination, found two which they considered deserving of special mention. Concerning them, through the courtesy of Mr. J. W. Dudley and others, we are able to give the information that follows:

STOWE'S WINTER.

The illustrations of this apple were made from specimens furnished by Mrs. Ella F. Miller of Perham. The fruit, we understand, grew upon the original tree. Several specimens were kept by the Secretary until the last of April when they proved to be well preserved, and the quality was good. It is described as follows from the fruit examined:

Fruit medium to large. Roundish conical, greenish yellow. Many small dots, nearly white. Stem rather short, slender, inserted in a medium cavity. Calyx partly open. Basin small and rather shallow. Flesh yellowish, tender, juicy, sub-acid. Core small. February to May in Aroostook. Good.

Mr. John W. Dudley of Castle Hill, writes concerning Stowe's Winter as follows:

"It seems that in 1861 Mr. Francis Stowe and wife came from Massachusetts and moved into the town of Perham. They heard there was no fruit raised here so they brought some apple seeds with them and planted them the next year, and among them when they came to bearing was this apple. The tree has been bearing about fifteen years. It is a vigorous grower and a good bearer, not bearing as early as some but when it comes to bearing it seems to bear a uniform crop each year of very fine specimens, keeping until June without any special care. Mr. Rufus Stowe, son of Francis Stowe, owned the farm that the original tree is on until May, 1895. At that time he sold to Mrs. Ella F. Miller, who owns it at the present time. By what I can find out about the tree by people that know it, I think it is another boom for Aroostook in the line of iron-clads, as it seems to keep later than any kinds we have so far.

"Mr. Oliver Nutting of Perham, says they are a good strong grower for top grafting; he has some on seedling trees and thinks very much of them as a grower for top grafting."

Mrs. Ella F. Miller, upon whose farm the fruit originated, kindly sent some fine specimens and in regard to the apple writes:

"Have lived on the place only since April last (1895). The seed from which the tree grown was taken from an apple raised in Massachusetts. Do not know the variety. Think it perfectly hardy. The top was broken off some years ago (do not know when), a yoke of oxen, with cart attached, ran over it. The limbs have made a good growth, are good shaped and bark is bright. Do not know the largest amount of fruit raised any one year.

I am very glad the fruit made a favorable impression on your committee. It is called a very fine apple by all who eat it. A few scions have been taken from the tree by Mr. Oliver Nutting and set in seedlings, have just commenced to bear. He raised about two bushels of them the past season. I saw and talked with him quite lately about the apple and he expressed himself as well pleased with it and quite sure, he said, it grew well grafted on other stock."

Mr. Rufus F. Stowe, who formerly owned the farm on which this apple grows, writes from Presque Isle:

"The seed was brought from Massachusetts sometime in the sixties, cannot state the exact time; the tree was set out in 1875. My father, Francis Stowe, moved from Marlboro, Mass., in 1861, and took up a State lot in what is now Perham plantation. He died January 5, 1894. I wrote to O. Y. Nutting of Perham, asking him about the seedling he grafted from the tree several years ago. He has some of the scions in large crab stock, also a few small trees whole root grafted. He writes that when he first grafted he thought it was going to be tender, but it has proved very hardy, a good grower and holds the fruit well, but must have some age before it will bear heavy. Will keep longer than anything excepting the Ben Davis and near even with that. The apple has had quite a local reputation for a number of years past, and has always borne the name Stowe's Winter."

HUBBARD SEEDLING.

This is reported as a seedling of Duchess of Oldenburg, bearing seven or eight years from seed. The tree is very hardy, standing the Aroostook winters without killing a bud. The tree is a vigorous grower. The specimens were a little past maturity and had been roughly handled, so no description is offered.

THE JAPAN PLUMS.

Mr. S. D. Willard, who was present a few years since at one of our winter meetings, recently gave some important information which we condense from the "Proceedings of the New Jersey Horticultural Society."

He received the first assignment from San Francisco, which was called the Botan, a name designating a general family of Japan plums. One of this lot was quite different from the rest in its habits of growth, fruit, color, wood, and everything else. This plum was afterwards named the Willard. It is the earliest of the Japan plums that have fruited in this country thus far. You can pick it when it is green and put it in the house, and it will turn a very nice purple. It sells well in the market because it is an early plum. It is smaller than the Burbank or Abundance. The Early June ripens about the same period. The trouble with most all Japan plums is, they set too large a body of fruit and require thinning. The Abundance comes later and the True Sweet Botan, which Mr. Willard pronounces the best of the Japan plums. Says it is more reliable than the Abundance at Geneva, and ripens about the same time or a little later.

The True Sweet Botan is now generally known as the Breckmans. There is one trouble with the fruiting of these trees, they sometimes bloom so early as to be caught by spring frost. The Burbank blooms later, and for this reason is one of the most reliable and for all purposes up to the present time it seems to be the best. As to productiveness, it is wonderful. It originated in this country in Mr. Burbank's experimental grounds, where he has done a great work in originating new varieties of fruits. He deserves to be regarded as a public benefactor.

Mr. J. H. Hale at the same meeting said of the Japan plums that they will admit of picking when in fair maturity of growth and then not sent to market for about two weeks, and then come out in good salable condition. In other words they may be picked and held for a long time and then be of good quality. The Burbank is the best of these plums so far. The Red June and Red Nagate do not take in the market, as they are small and early.

Prof. Samuel B. Green, Horticulturist of the University of Minnesota Experiment Station, writes the Secretary: "We are experimenting with Japan plums but do not expect as much from them as from our improved native sorts."

Several growers have exhibited specimens of Japan plums, Abundance and Burbank, at our exhibitions. The fruit is so attractive in its appearance and so much has been said about them that more or less have set the trees. So far we have only favorable reports from growers. As yet, however, it is hardly safe to plant largely, unless one is willing to regard such action as experimental. They certainly deserve a thorough trial in Maine.

JOSSELYN BOTANICAL SOCIETY OF MAINE.

During the spring of 1895, a number of people actively identified with the study of Maine plants thought it would be highly advantageous, if they, and other persons of similar interests, could come together and, by an exchange of thoughts and methods of work, place upon a more definite footing this branch of scientific study in Maine. This suggestion was first made by Mrs. H. K. Morrell of Gardiner, and very soon the matter was taken actively in hand by the present Secretary, and a circular, signed by a number of representative persons, was issued calling a convention of Maine botanists at Portland, from July 12 to 16, 1895.

The meeting opened on the morning of July twelve at the rooms of the Portland Society of Natural History. In the absence of the distinguished President, Dr. William Wood, the Vice President, Mr. Joseph P. Thompson called the meeting to order and extended to the convention a cordial welcome to the rooms of the Natural History Society. Prof. A. L. Lane of the Coburn Classical Institute, Waterville, was made chairman of the convention, and Mrs. Mary E. Taylor of Portland, Secretary. A committee of arrangements was appointed, consisting of Merritt Lyndon Fernald, Joseph P. Thompson, Mrs. Helen Coffin Beedy, Miss Kate Furbish and Miss Ellen M. Cram.

The preliminary business being settled, Mr. Frank S. Collins of Malden, Mass., gave a very instructive and practical talk upon the study of marine algæ or "sea mosses," illustrating his remarks with many carefully prepared specimens. Mr. Collins was followed by Miss Kate Furbish who had brought with her from Poland Springs a number of the rarer and more interesting plants of that vicinity. Her talk was informal and many of those present took active part in the discussion of the plants exhibited.

In the afternoon the party went to Fort Preble where they were very kindly received by the commanding officer, Lieut. E. E. Gayle. Under the direction of Mr. Collins, the sea shore about the fort was carefully examined and many algæ detected, these specimens proving valuable material for still further practical remarks and directions.

The second day's session, Saturday, opened with a very suggestive paper by Mrs. Mary E. Taylor on the teaching of botany in the schools. The paper contained many valuable hints, and the discussion which followed showed a lively interest in the important question. The last of the forenoon was taken up by Mr. Fernald in a talk upon the geographical distribution of Maine plants. Mr. Fernald, in his remarks, and by means of a specially prepared map, pointed out the limits of various groups of plants which creep up into the State from the South, or down from the North. He also emphasized the importance to agriculture of determining the exact geographical limits of the peculiar flora found in the Aroostook valley.

ORGANIZATION.

In the afternoon a permanent organization was formed, with the following officers:

Honorary President: William Wood, M. D., Portland.

President: Prof. A. L. Lane, Waterville.

Vice Presidents: Prof. Leslie A. Lee, Brunswick; Miss Kate Furbish, Brunswick; Mrs. Helen Coffin Beedy, 11 Mellen St., Portland; Miss Mary A. Clark, Ellsworth; Mr. Edward L. Rand, 53 State St., Boston, Mass.

Secretary: Merritt Lyndon Fernald, 41 Langdon St., Cambridge, Mass.

Assistant Secretary: Mrs. Mary E. Taylor, Portland.

Treasurer: Miss Ellen M. Cram, Portland.

Committee on Plant Distribution: M. L. Fernald, Cambridge, Mass.; Miss Kate Furbish, Brunswick; Miss Lillias Graves, Presque Isle; Mrs. C. W. Keyes, Farmington; Clarence H. Knowlton, Farmington.

Committee on Plant-Lore: Mrs. H. K. Morrell, Gardiner; Mrs. Helen Coffin Beedy, Portland; H. K. Morrell, Gardiner; J. P. Thompson, 145 Park St., Portland; Miss Isabell S. Allen, 1038 Congress St., Portland.

Committee on Bryophytes: J. Franklin Collins, Brown University, Providence, R. I.; Miss Mary A. Clark, Ellsworth; John Inglee Phinney, Machias; Edward L. Rand, Boston, Mass.; Prof. W. S. Bayley, Waterville.

Committee on Algæ: Frank S. Collins, Malden, Mass.; Prof. F. L. Harvey, Orono; Miss E. A. Winslow, Westbrook.

Committee on Fungi and Lichens: Prof. F. L. Harvey, Orono; John K. Parks, Portland; Miss Clara E. Cummings, Wellesley, Mass.

The direction of the work of the society is in the hands of an executive committee, which consists of the officers and the chairmen of the various committees.

The name decided upon for the society was the Josselyn Botanical Society of Maine. Thus the society hopes to make better known to the people of the State the name of the first man who made any detailed study of the plants of Maine. John Josselyn spent a portion of the seventeenth century at Black Point, Scarboro, where, as he says, he made it his "business to discover, all along, the natural, physical, and chyrurgical rarities of this new found world." Most of his observations were published in London, in 1672, in his famous book, "New England's Rarities Discovered: in Birds, Beasts, Fishes, Serpents and Plants of that Country."

At this business meeting it was also decided that all persons, who should pay to the treasurer, before the next regular meeting, the sum of twenty-five cents, should be considered charter members. Most of the members returned home Saturday evening, but a small and enthusiastic party waited until Monday and enjoyed a day's botanizing in the region of Blackstrap in Falmouth. Altogether the meetings at Portland were highly successful and encouraging, about one hundred people attending the different sessions.

PROVISIONAL CONSTITUTION.

The Executive Committee of the Society held a meeting at Bowdoin College, Brunswick, December 31, 1895, and drew up a constitution for consideration at the next meeting of the society. The time and place of meeting, as well as the final programme, was left with the President and Secretary. The following provisional constitution has been made as simple and direct as possible, and it will doubtless be adopted with only slight changes:

ARTICLE I.

Name and Object. The name of this Organization shall be the Josselyn Botanical Society of Maine; and its object shall be to promote the study of the Flora of the State.

ARTICLE II.

Officers. The officers shall be a President, five Vice-Presidents, a Secretary, an Assistant Secretary and a Treasurer; and their duties shall be those usually performed by such officers. They shall be elected annually, and shall hold office until others are elected in their place.

ARTICLE III.

Membership and Fees. Any person interested in botany shall become a member by vote of the Society, and by payment of the necessary fee. The initiation fee shall be one dollar. For the first year of membership there shall be no assessment, but after that there shall be an annual fee of fifty cents.

ARTICLE IV.

Committees. Such Committees shall be appointed as the work of the Society shall make necessary. The Executive Committee shall be composed of the officers of the Society and the Chairmen of the various committees; and those present at any regularly called meeting shall have power to transact the business of the committee.

ARTICLE V.

Meetings. The Society shall hold an annual meeting. Special meetings shall be called at the discretion of the Executive Committee.

ARTICLE VI.

Amendments. This Constitution may be amended at any meeting of the Society by vote of two-thirds of the members present.

Seventy-two charter members were reported at the time of the adoption of the constitution.

It was decided to hold the next meeting at Farmington, July 7–10, 1896, and an entertaining programme was arranged for the meeting. The Maine Central R. R. and the Stoddard House granted special rates to all members of the Society. By this recognition, as well as by the hearty reception promised by the people of Farmington, the Society feels that its efforts are already being appreciated in the State.

METHODS OF WORK.

The object of the society is primarily to stimulate an interest in the study of botany in Maine. The methods employed in doing this will be of two kinds. First, by holding annual public meetings where the members may become personally acquainted and may discuss the problems suggested by their work; and where they may hear and meet specialists upon various subjects of importance to the professional botanist, the teacher and the agriculturist. A number of specialists upon branches of pure and applied science, are natives of Maine, or spend their summers within her borders, and many of them have given assurance of their interest and willingness to co-operate in this work. Still others will be ready at small expense to the society to attend the meetings and give the members the advantage of their advice. The extent to which the society may receive the assistance of these specialists must depend entirely upon the encouragement and support of the people of the State, and very soon the society hopes to show that it deserves both the intellectual and material support of the progressive people of Maine.

The second method by which good will be accomplished is through working committees. The State of Maine has been peculiarly slow in recognizing the value of careful scientific exploration. While many other states have supported scientific institutions and surveys, the State of Maine has recently given only the slightest possible recognition to such work, and that only to the branches which have an immediate and material influence upon agricultural pursuits. The work undertaken by the committees of this society will be at least an effort to bring the State of Maine up from a position of absolute indifference to the value of scientific work to a level where others may see that there is at least a living interest in science within her borders.

The work of the Committee on Plant Distribution is of direct importance to the agricultural interests of the State. The aim is to bring together all authentic information and material which shall show the ranges within the State of the native and introduced plants. Aside from specimens of the plants of each region the committee is attempting to secure accurate records of the climate and soils of each locality. Already sufficient information has been collected to show that the limits of the rich belt, of which "the Aroostook" forms a part, can be readily described by a knowledge of the plants of the region. That such scientific work as this is of the highest economic value should be readily apparent to all who desire agriculture and material progress in the State. The record of introduction and distribution of weeds and their progress through the State is another eminently practical feature of the work undertaken by this committee.

The Committee on Plant-Lore is bringing together all information about plants as known among unbotanical people. All popular ideas, superstitions, and traditions, current among Maine people, concerning the plants about them, and all popular names are collected and carefully preserved. Of a still more practical nature is the collection by this committee of information concerning the uses of our native plants, either as foods or medicines. Such information is highly interesting and much of it may be of considerable economic importance.

The Committees on Bryophytes (mosses), Algæ, Fungi and Lichens have undertaken the study in Maine of low groups of plants which have been almost entirely neglected in the past. the committees contain a number of recognized authorities on these groups and there is promise that much valuable work will be accomplished under their direction.

The committees will all gladly welcome any information or suggestions from persons interested in Maine plants. And as soon as the society becomes well established, and its work is well in hand, the people of the State may expect to see the results of these investigations put into permanent and intelligible form.

WORLD'S COLUMBIAN FAIR AWARD.

About the middle of May, 1896, the secretary received the awards for the World's Columbian Commission. They consisted of an engraved diploma and a bronze medal. The diploma reads as follows:

THE UNITED STATES OF AMERICA.

By act of their Congress have authorized the World's Columbian Commission at the International Exhibition held in the city of Chicago, state of Illinois, in the year 1893, to decree a medal for specific merit which is set forth below over the name of an individual judge acting as an examiner, upon the finding of a Board of International Judges, to State of Maine, Augusta. Exhibit, collection of apples.

AWARD—For a collection of highly meritorious apples, contributed by eighteen growers of the State. The fruit is of good size and color and is free from blemishes. The nomenclature is very correct.

B. Starratt, President Department Committee; B. Starratt, Individual Judge; Geo. R. Davis, Director General; John Boyd Hacker, Chairman Executive Committee of Awards; T. W. Palmer, President World's Columbian Commission; Jno. T. Dickinson, Secretary World's Columbian Commission.

The Bronze Medal is in relief and on one side shows the landing of Columbus. On the reverse the following words: "World's Columbian Exhibition, in commemoration of the four hundredth anniversary of the landing of Columbus, 1492-1893. To Maine Pomological Society." The medal is mounted in plush and contained in an aluminum case.

Shortly after Secretary McKeen of the State Board of Agriculture received another diploma and medal.

The Diplomas and Medals will be on exhibition at the Society's fairs, after which one will be hung in the rooms of Board of Agriculture in the State House, the other will be subject to the order of the Society.

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