Public Documents of Maine:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

Public Officers and Institutions

FOR THE YEAR

1892.

VOLUME II.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1892.

OAK HALL. WINGATE HALL. COBURN HALL. SOCIETY HALL. HORTICULTURAL HALL.
BOARDING HOUSE. CHEMICAL LABORATORY. PRESIDENT'S HOUSE. EXPERIMENTAL STATION.

PRINCIPAL BUILDINGS.

AGRICULTURE OF MAINE.

THIRTY-FOURTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

Maine Board of Agriculture,

FOR THE YEAR

1891-92.

PRINTED BY ORDER OF THE LEGISLATURE.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1892.

To the Honorable, the Governor and Council of Maine:

In compliance with the law of the State, I have the honor to present the report of the doings of the Maine Board of Agriculture for the year 1891.

B. WALKER McKEEN, *Secretary.*

AUGUSTA, April 30, 1892.

MAINE BOARD OF AGRICULTURE—1891.

OFFICERS.

B. W. McKEEN, President.

B. F. BRIGGS, Vice President.

Z. A. GILBERT, Secretary.

Members Chosen by County Societies.

			Term expires 3rd Wed. in Jan.
Piscataquis County,	Thomas Daggett,	Foxcroft,	1892
Penobscot "	*B. A. Burr,	Bangor,	1892
Franklin "	C. E. Wheeler,	Chesterville,	1892
Knox "	F. L. Mansfield,	Hope,	1892
Aroostook "	A. L. Haines,	Maple Grove,	1892
Androscoggin "	B. F. Briggs,	Auburn,	1893
Waldo "	Freeman Atwood,	Monroe,	1893
Lincoln "	E. W. Stetson,	Damariscotta,	1893
Kennebec "	*H. O. Nickerson,	Readfield,	1893
Washington "	*Edward A. Moore,	Machiasport,	1893
Cumberland "	W. H. Vinton,	Gray,	1894
Oxford "	B. Walker McKeen,	Fryeburg,	1894
York "	B. F. Pease,	Cornish,	1894
Somerset "	A. R. Smiley,	Skowhegan,	1894
Sagadahoc "	F. S. Adams,	Bowdoin,	1894
Hancock "	Vacancy.		

Members from State College.

President, M. C. Fernald, Orono.

Professor of Agriculture, Walter Balentine, Orono.

Elected by the Board.

Z. A. Gilbert, North Greene, Secretary.

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*Deceased.

MAINE BOARD OF AGRICULTURE—1892.

OFFICERS.

B. F. BRIGGS, PRESIDENT.

F. S. ADAMS, VICE PRESIDENT.

B. WALKER McKEEN, SECRETARY.

MEMBERS CHOSEN BY COUNTY SOCIETIES.

				Term expires 3rd Wed in Jan.
Androscoggin	County,	B. F. Briggs,	Auburn,	1893
Waldo	"	Freeman Atwood,	Monroe,	1893
Lincoln	"	E. W. Stetson,	Damariscotta,	1893
Kennebec	"	J. B. Lowe,	Readfield,	1893
Washington	"	F. M. Thompson,	Roque Bluffs,	1893
Cumberland	"	W. H. Vinton,	Gray,	1894
Oxford	"	B. Walker McKeen,	Fryeburg,	1894
York	"	B. F. Pease,	Cornish,	1894
Somerset	"	A. R. Smiley,	Skowhegan,	1894
Sagadahoc	"	F. S. Adams,	Bowdoin,	1894
Hancock	"	Vacancy.		
Piscataquis	"	A. W. Gilman,	Foxcroft,	1895
Penobscot	"	J. W. Green,	Bangor,	1895
Franklin	"	T. B. Hunter,	Strong,	1895
Knox	"	O. Gardner,	Rockland,	1895
Aroostook	"	Ira J. Porter,	Houlton,	1895

MEMBERS FROM STATE COLLEGE.

President, M. C. Fernald, Orono.

Professor of Agriculture, Walter Balentine, Orono.

ELECTED BY THE BOARD.

B. Walker McKeen, Augusta, Secretary.

REPORT.

ANNUAL MEETING, 1892.

The annual meeting of the Maine Board of Agriculture was held at the office of the Board, in the State House, Augusta, January 20 and 21, 1892, in accordance with the statutes, and transacted the following business:

The meeting was called to order by President McKeen at 11 o'clock in the forenoon and the published call for the meeting was read by the Secretary. On motion of the member from Sagadahoc, it was

Voted, That a committee on credentials be appointed by the chair, and the following were appointed:

F. S. Adams, Sagadahoc,	*Committee*
W. H. Vinton, Cumberland,	*on*
B. F. Pease, York,	*Credentials.*

This committee subsequently reported the following members qualified to seats on the Board:

Theron B. Hunter, Strong, for Franklin county. J. B. Lowe, Readfield, for Kennebec county, to fill the vacancy caused by the death of H. O. Nickerson. Augustus W. Gilman, Foxcroft, for Piscataquis county. F. M. Thompson, Roque Bluffs, for Washington county, to fill the vacancy caused by the death of Edward A. Moore. J. W. Greene, Bangor, for Penobscot county. Ira J. Porter, Houlton, for Aroostook county. Obidiah Gardner, Rockland, for Knox county.

The report was accepted, and the members were duly elected for the time set against their names.

On motion of the member from Cumberland,

Voted, That 9.30 P. M., Thursday, be set apart for memorial services for deceased members. On motion of the member from Sagadahoc, *Voted*, That a committee be appointed, to receive, sort and count votes.

E. W. Stetson of Lincoln,
J. W. Greene of Penobscot,
A. R. Smiley of Somerset,

were appointed as such committee.

The following officers were then unanimously elected:

B. F. Briggs, Auburn, *President.*
F. S. Adams, Bowdoin, *Vice President.*

On motion of President M. C. Fernald, Orono,

Voted, That the election of Secretary of the Board be postponed to Thursday morning, immediately after the memorial exercises.

Proceeded to the election of Clerk, when G. M. Twitchell was unanimously elected.

On motion of the member from Cumberland,

Voted, That the chair appoint a committee on pay roll, and the following were appointed as such committee:

W. H. Vinton, Gray,
Ira J. Porter, Houlton,
T. B. Hunter, Strong.

On motion of President M. C. Fernald,

Voted, That the member from Cumberland cast the ballot of the Board for the President and Vice President, as Executive Committee, and the following were declared elected:

B. F. Briggs, Auburn,
F. S. Adams, Bowdoin.

Adjourned to 2 o'clock P. M.

Met according to adjournment, President Briggs in the chair.

The first business was a paper by Professor Walter Balentine on "The Scope and Character of Institute Work."

Prof. Balentine said: "When the secretary announced in the early autumn that the character of the institute work for the season was to be varied from that of previous years; that the institute was to become more a school of instruction in which all off hand practical talks on agricultural topics of special interest to the farmers in the locality where the meeting was held, should take the place of the set addresses of previous years, some of us were curious as to the results. After observing the work of the Board through the fall and winter I think we are safe in saying that though no radical change has taken place in the methods of conducting the institutes, there is a movement in the right direction.

"By the old method the essayist was inclined to deal too much with general principles, and to spend too much time in covering ground already familiar to most farmers, while neglecting points of detail where help is most needed. By the plan recently adopted the aim has been to place speakers on the institute programme who have been especially successful in some special lines of work and to have them in an easy familiar way describe in detail just how their success has been attained, and the obstacles they have encountered and overcome. Liberty has been given to interrupt the speaker at any point for asking questions, and the farmer has thus been able to turn the discourse in directions in which he most needs information. I would by no means discourage the teaching of principles on which foundation all successful agriculture is based. Neither do I object to good solid theoretical instruction in the sciences related to agriculture for the institute is the only agricultural high school that is available to the majority of our farmers, but I do wish to commend the effort that has been made to introduce work of a more immediately practical character and to record the success attending these efforts."

The speaker mentioned other practical features of the work that had been done at the institutes this fall and winter.

During the fall there were called into the institute work in the State two men of national reputation, Professor Roberts of Cornell and T. B. Terry of Ohio; one to talk on dairy topics and the other on potato culture. This move has been heartily approved by some, and others have said let us have men from within the State, men who understand Maine soil, etc. There is a little feeling of State pride, which is well enough in its way but let us not carry State pride so far as to refuse to profit from the teachings of successful farmers in other states.

Both of these men are known to be farmers who have made farming pay, and though not all that they may have said to us were applicable to our condition and surroundings, the men are rare in Maine who could have given us so much that we could have taken home and put into practice with greater certainty of being on the right track.

As to the future of the Board the speaker said: "The one great problem that the people are figuring on everywhere, is to get the greatest return for greatest expenditure of energy and this is the problem that the Maine Board should and the Maine farm is solving."

I was told in Aroostook county that yearling and two-year-old steers were selling this fall and winter, at $8 to $12 per head. Those steers at that age actually selling for less than good veal calves at six weeks old! The farmers raising these animals are not receiving much for the labor expended because the product is not finished. Those who have bought this young stock and fed it have been doing good business. It seems to me that the Board of Agriculture might do a good work by showing how this class of stock may be put upon the market in a form that shall command better returns to the farmer raising it.

Of late the Board has given some attention to mutton sheep and the raising of lambs for the market. The average profit in the business can be greatly increased by teaching those engaged in it the demands of the market and how to market them.

The Maine Experiment Station in its forthcoming report will show that it is not difficult to realize $40 per ton for grain fed to sheep and lambs in the value of lambs alone, to say nothing of the increased value of the sheep, and yet many sheep raisers are selling the grain for $20 to $30 per ton and feeding none to their sheep while carrying and suckling lambs. Let the Board of Agriculture push this work.

Dairying has received already considerable attention from the Board, more perhaps than any other branch of farming.

There is still much work that may be done on the old lines of care and feeding of animals, management of milk, butter making, etc.

But it seems to me that while the products of one creamery are superior to those of another it would be worth while to investigate and compare the methods of manufacture at the different creameries and be able to suggest improvements so that the butter of the State as a whole might require a reputation that would give us better prices.

I have no doubt but the introduction of cream and milk testers into creameries and paying for cream according to test would do much toward increasing their patronage. But there is another use to which the tests may be put, and that is in watching the buttermilk, and see how much butter fat is being lost in manufacturing.

The cheese factories need more attention than do creameries. Is there much doubt that the cheese business is the best business for the dairymen for the summer months? I think there is not. There is no reason why our cheese factories should not be patrcnized as well as the creameries, except that as the work in the cheese factories has not reached the stage of perfection, as in the case of creameries. Our Secretary should inquire into these facts and lay them before the executive committee. It may be found that some of the money for institutes can be devoted to employing an expert cheese maker.

Stock husbandry should be especially fostered. Prof. Balentine believed that practical men can be found in our own State to discuss these matters intelligently. He believed there is a tendency to cover too much ground in this institute work. There should be fewer subjects treated.

A discussion followed by Messrs. McKeen of Oxford, Vinton of Cumberland, Adams of Sagadahoc, Porter of Aroostook, Greene of Penobscot, Lowe of Kennebec, Gilman of Piscataquis, President Fernald of the State College, Thompson of Washington, Prof. Balentine of the State College, Gardiner of Knox, Pease of York, Smiley of Somerset, and Hunter of Franklin.

Adjourned to 9 30 Thursday, A. M.

Met according to adjournment.

[redacted]

Mr. J. W. Greene of Bangor presented a memorial and resolutions on the death of Mr. B. A. Burr, member from Penobscot.

Mr. President and Gentlemen: I rise to present a few thoughts upon the death of Benjamin A. Burr, late an honored member of this Board, whose death occurred at his home in Bangor, April 22d, 1891, at the age of seventy years.

To those who have known Mr. Burr as a member of this Board no extended eulogy of mine can add to your respect for his memory. Ever genial, quiet and unassuming in manner, yet possessed of sound judgment and a keen desire to benefit his fellowmen he was a valuable counsellor in all your deliberations and will be greatly missed.

But as a neighbor and personal friend of Brother Burr, as we had learned to call him, I will claim your attention for a few moments. He was a man who had attained his position in society by strictly adhering to his convictions of *right*, and his success was the reward accorded him by his associates. His life exemplifies the possibilities in our community. A farmer boy, the youngest of eleven children, he set out at fourteen years of age to make his fortune. Learning the printing business he advanced as opportunity offered, from type setting to job printing, editor and publisher. Early in his business career he espoused the cause of *human freedom* and with an associate published an able paper devoted to free soil principles. For over twenty years Brother Burr put his best efforts into this paper and in this manner had much to do in forming and ripening public opinion; always advocating the great principles of *exact and equal justice to all men*. As the star of the Republican party rose and commanded the attention of the people, Brother Burr joined the party and has always worked in accordance with his former free soil principles. A farmer boy, the love for the home farm never left him. The farm was retained by him as long as he lived and left to his family at his death. While we grieve at the loss of a friend, an honorable business man, a man devoted to the interests of agriculture, we feel grateful to the "Giver of all good" for his happy life and high moral principles, and rejoice that we have a country that helps to develop such men.

Mr. President: In order that our records may bear tribute to the memory of Mr. Burr, I desire to present the following:

Resolved, That in the death of Benjamin A. Burr, the Board of Agriculture and the agricultural interests of our State have lost an able advocate and sincere friend.

Resolved, That these resolutions be placed upon the record of this Board and published with the same and a copy sent to the family of the deceased.

Mr. J. B. Lowe presented memorial and resolutions on the death of H. O. Nickerson, member from Kennebec.

Whereas, the Supreme Disposer of all events has been pleased to call from his earthly labors, our late associate and colleague, H. O. Nickerson of Readfield, therefore be it

Resolved, That in the death of Mr. Nickerson, this Board has lost an earnest, intelligent and active member, the cause of agriculture a zealous and efficient worker, and the community at large an honest and upright man.

Resolved, That in his faithful and conscientious discharge of the various duties and trusts committed to him, he has left an example of fidelity, and of steadfastness to principle, well worthy of imitation and emulation.

Resolved, That to his widow and children, in their loss of so kind, thoughtful, and devoted a husband and father, we tender our sincerest sympathies, and direct that these resolutions be entered upon the records of the Board, and that an attested copy of the same be forwarded by our Secretary, to the family of the deceased.

Mr. F. M. Thompson, Roque Bluff, presented a memorial and resolutions on the death of Mr. E. A. Moore, member from Washington county.

Mr. President: Allow me to announce the death of Edward A. Moore, the late member of the Board of Agriculture from Washington county, who died at his home in Machiasport on the fourth of March, last, being taken from an active and busy life with hardly a moment's warning. His death being caused by injuries received from a bull the previous evening.

He was born, reared and died on the farm of his father, the late Capt. Arthur Moore, who died some years ago. Mr. Moore, at his father's death assuming the care of the farm with his widowed mother and two sisters, who now deeply mourn the loss of a kind and helpful son, and an affectionate brother.

He was a graduate of Washington Academy at East Machias, where he received a good, practical education, which in addition to a naturally retentive memory, made him a man of influence and good ability in the society in which he moved. He was always a good citizen and a kind neighbor, one who was always ready to lend a hand to the needy and suffering; and by his honest and pleasing manner won a vast number of friends who feel in his death the loss of a kind friend and neighbor and extend their sympathy to his bereaved and sorrowing mother and sisters.

Mr. Moore for years had supplied the steamboat running between Machiasport and Portland with the products of his farm, sparing no pains to have everything in first-class order and on time. He was an active worker in all agricultural pursuits, taking an interest in everything that tended to the improvement of the farm and all its surroundings.

Mr. Moore was a breeder of Short-Horn cattle and Cotswold sheep; sparing neither expense nor time in order to procure the best. Just prior to his death he contemplated changing his Short-Horns to Jerseys and had started a small herd which, had he been spared, he would have doubtless made as good as any in the county if not in the State.

Mr. Moore was in former years an active member of the West Washington Agricultural Society but when that society split and the Central Washington was formed he turned his interest and support to that, it being located in his section, was more convenient for the exhibit of his stock, being one of the directors of this society until his death. When the society was called on to be represented on the State Board, Mr. Moore was chosen to fill that office which he held at the time of his death. Of his adaptability for the office, his devotion to duty and general interest in the work, all who knew him personally are acquainted; his friends at this Board can attest to his faithfulness and ability for the place which he filled.

I desire further to submit the following:

Resolved: That in the death of E. A. Moore, the Maine Board of Agriculture has lost a worthy member, the cause of agriculture an earnest and constant worker, and the State a loyal citizen.

Resolved: That these resolutions be placed upon the records, be printed with the doings of the Board, and a copy be sent to the widowed mother and sisters of the deceased.

Remarks followed by President Fernald of State College, Vinton of Cumberland, Smiley of Somerset, Hunter of Franklin, McKeen of Oxford and Secretary Gilbert.

The resolutions were then unanimously adopted and ordered placed on record.

Secretary Gilbert made a report of the financial transactions for the year as follows: Expended during the year, $3,200.65; excess of appropriation, $200.65; expenditure from January 1 to January 20, 1892, $379.39; drawn from appropriation of current year, $580.04. Report accepted. (Since the annual meeting bills to the amount of $91.59, contracted before that date, have been paid and should be added to the above figures.)

Voted to postpone election of Secretary until after the introduction of the full programme of the forenoon.

J. W. Greene, member from Penobscot presented a paper on

RESPONSIBILITIES OF INDIVIDUAL MEMBERS.

Mr. President and Gentlemen, Members of the Board of Agriculture:

I do not understand how it happens that I am on the programme to speak upon one of the most important subjects before us to-day.

Whether this was arranged by the powers that do such things or as a compliment to my freshness, for I am Green you know, or as a test of your good nature has not been revealed to me.

And I was put on the programme somewhat as a person is born, without my knowledge or consent, but shall, as is the other case, accept the situation. What I may say will not come to you as the experience of an old member who has been associated with you in the work of the past but as the views of a layman just coming from the people and realizing somewhat of the wants of the people.

In considering the "Responsibilities of Individual Members" we shall include the duties of members as well for we can hardly separate the two.

First we are to remember that the Board of Agriculture is nothing more than its seventeen individual members and all the work completed by the statute creating Board is to be done by these seventeen individuals. The statute reads "The Maine Board of Agriculture for the improvement of agriculture and the advancement of the general interests of husbandry consists of the President and Professor of Agriculture of the Maine State College and one person from each county elected by ballot, etc." Plainly the Board was established for the improvement of our agriculture, to be a help to our farmers, to create an interest in and advance the science of farming.

In another section it defines the duties of the Board still further by saying, "The Board shall investigate such subjects relating to agriculture, horticulture and the arts connected therewith, as they think proper, clearly indicating that the Board shall be active and perform such work as shall assist our people. And it becomes us to consider well what can best be done to accomplish this purpose.

With this object in view, let us see how our State compares with other states in the Union. We may find that we are not what we think we are. We have for years considered our State a good hay producing State, but in comparing it with others we find this is not the case. Of the forty-six states and territories reported to the census bureau for 1889, Maine stands almost at the foot of the list in yield of hay per acre. Forty-three states yield more per acre than Maine and the value of the crop per acre is low, thirty-one states raising more value of hay per acre than Maine. Thus we find that at present with an average of only .97 of a ton per acre we are not a good hay producing State.

In the matter of corn we are better off, but two states, New Hampshire and Vermont, yield more per acre than Maine with her 32.2 bushels per acre and but one, New Hampshire, exceeds our State in value per acre of her corn crop, Maine $24.25, New Hampshire $24.32, practically the same.

In wheat we stand seventeenth in yield and fifth in value per acre. Oats eighteenth in yield and thirteenth in value. In potatoes we are seventh in yield and eighteenth in value per acre. This being the present condition I submit is there not need of improvement in these matters.

We know nearly all of our mowing land is capable of yielding two tons per acre instead of less than one.

Our corn lands can be made to yield 50 bushels to the acre, instead of 32.2. Oats are a hardy crop and well acclimated, who will say that they cannot be made to yield 50 bushels instead of 28 per acre. A large part of Maine seems to be the natural home of the potato, yet we now grow only an average of 94½ bushels per acre and we feel confident that this yield can be largely increased.

In the matter of our stock too we are well aware that our people do not average to receive near the net returns that they ought. Too large a part of our horses and cows do not pay their board, they are fed scantily or in an unprofitable manner and fail to pay the cost of keeping. And why this condition of things among our farmers? Why these small crops? Why this unprofitable stock?

The causes must not be laid to our climate, nor our soil, for there are those among us who raise good crops and have profitable cattle, and the lack of income must not be laid to our markets or low prices for we have those with us who are making money by farming. The answer is apparent to all. It is largely due to a lack of knowledge among our people, sometimes perhaps to a lack of interest in the work and thereby neglecting to do what is known ought to be done.

Then here is where the responsibility of our Board begins. The appeal for help is coming up from every valley and from every hillside in our State. The demand is, Tell us how to raise better crops, how to raise them at less cost, how to so keep our stock as to get the most profit. In fact, How to make farming pay.

The cry is heard from every county, "Come over and help us." Now if the members of this Board possess the knowledge and have the ability to do this they can be of great service to our people. That they are able to be of service, we have only to refer to the interest manifested by our farmers in the institutes held in various parts of the State. Knowledge is being diffused, a better condition of farming is beginning to dawn. But still there is need of active work. We are happily fixed in this State in being able to reach the farmers, by pen and voice we can reach nearly all of them. Most of our papers are glad to publish anything of interest relating to farm topics. Then we have the Grange which brings us in close contact with the most progressive classes in the community, and by these methods advanced ideas are easily spread. Not only do individual farmers ask for a helping hand but there are matters of public interest which require the attention of the Board.

It is admitted by all classes that the farmer is paying more than his just proportion of the taxes in our State and we claim that this is not only the case with the farmer but with the mechanic and laboring man whose only property is invested in his home. All this class of property is in view, easily reached and surely taxed, while the owner of money either at interest or laying idle, is virtually, not taxed at all.

This burden must be lifted, and our people have a right to expect all the help that we as individual members or as a board can render. With all this work before us, how can it best be done? The statute also provides the Board shall appoint a secretary as its chief executive officer and may prescribe his duties. But the duties of the Board cannot be said to close here. We believe that each and every member of the Board should assist the secretary, not delegate all the work to him and then complain because enough work is not accomplished.

They should have full charge of the secretary's work, aid and direct him in it. Each member is expected and ought to know the needs of his own county and should be alive to ascertain what will be of benefit.

In arranging institutes or other public meetings, he should be active, and by advertising and personal work wake up an interest among his people. The industry we represent runs back in the past as far as the human race, and must continue as long as the human race exists. Other industries may drop out and human life continue, but when the earth fails to yield her increase all animal life must cease. Therefore furnishing sustenance to all, any improvement in our work benefits every human being. If we are able to advocate methods whereby our grass, our grain, and fruit crops can be increased, if we can introduce such a stock husbandry as will lesson the cost of keeping and increase the net returns, we shall have succeeded in our work. Let us realize that to be a member of this Board obligates us to work for this end and that the member who will most command the respect of his constituents will be the man who is most active and who is a member 365 days in the year.

These, gentlemen, we believe to be the duties and responsibilities of members of this Board. Shall we meet them? Shall we write, by our deeds, on the pages of history that the Board of 1892 was the most active, and accomplished more good than any that has yet served the State?

Shall our influence be felt in awakening renewed interest in our avocation, in building up among our friends, that respect for and pride in our calling that it deserves. Shall this influence be spread like beams of sun-light all over our land till it has permeated every hamlet and every farm house in our beloved commonwealth?

Remarks followed by Messrs. Vinton of Cumberland, McKeen of Oxford, Briggs of Androscoggin, Prof. Balentine of the State College and others.

The committee on pay-roll reported, and the same was accepted, the amount of the pay roll being $330.80.

Proceeding to the election of Secretary, B. W. McKeen received the unanimons vote of Board and was declared elected.

Adjourned to meet at two o'clock P. M.

Afternoon session, met according to adjournment; Vice President Adams in the chair.

President M. C. Fernald of the State College, Orono, delivered an address upon "Educational Features of Institute Work."

President Fernald declared that the institute had for its primary object, instruction. The distinctive features of it should be breadth, both in the subjects and in the manner in which they are treated by the essayists. What is done should be representative of advanced thought and practice. Attention should be given to the manner of presentation, both in the form of lectures and in the discussions. He believed thoroughly in discussion as a means of awakening interest, etc., but thought that it ought to be directed closely in the line of the subject. The educational results of the institute work are both direct and incidental. Interest in the topics presented is awakened and those present are led to take up in the future an intelligent study of reports, papers and special subjects. This larger interest awakened in agriculture, can but result in better practice, larger profits and a larger life.

The speaker said he would suggest that each meeting should have a distinct character adapted to the locality and at this point he referred to the topics taken up at the several institutes as shown in the report of 1890. For instance if it was decided to have one institute take up the subject of dairying the work should be devoted to that and several topics should be brought in, as why dairying is a good business for the Maine farmer; the quality of butter; fine points in butter making; Canadian cheese making; the market outlook for dairy products, work of the separator; dairy school at the State College; products of the dairy, and how to secure them; dairy temperament in cows. He believed that especial care should be taken in the course of these institutes to have part of the programme adapted to the young people that may become interested in agriculture.

Mr. Vinton of Cumberland presented the following resolutions which were unanimously adopted:

Resolved, That the thanks of the Maine State Board of Agriculture be extended to the Maine Central Railroad for reduced rates to the meeting, to the proprietors of the Cony House for favors, and to the press of the State for publishing the many notices without expense.

Resolved, That the executive committee and the secretary are hereby constituted a committee whose duty it shall be to urge upon the next legislature the importance of so amending existing laws, or so enacting new laws as shall have a tendency at least, to relieve the farmers of the State from the unequal and unjust burden of taxation now so heavily resting upon them.

Resolved, That this committee also procure an amendment of section two of chapter fifty-eight of the Revised Statutes so as to provide a more equitable method of electing members of the Board.

Adjourned.

B. WALKER McKEEN, *Secretary*.

OFFICERS OF AGRICULTURAL SOCIETIES—1892.

Societies.	President.	Post Office.	Secretary.	Post Office.	Treasurer.	Post Office.
State Agricultural	S. G. Jerrard	Levant	G. M. Twitchell	Augusta.	Eben G Eveleth	Auburn.
Eastern Maine Fair Associa'n,	J. P. Bass	Bangor	E. L. Stearns	Bangor	E B. Nealey	Bangor.
Maine State Pomological	Chas. S. Pope	Manchester	D. H. Knowlton	Farmington	A. S. Ricker	Turner.
Aroostook County	S. W. Porter	Houlton.	F. W. Benn	Houlton	A. H. Fogg	Houlton.
Aroostook, North	G. M. Park	Presque Isle	R. J. Smith	Presque Isle	James W. Bolton	Presque Isle.
Aroostook, Madawaska.						
Aroostook, Van Buren.						
Androscoggin County	D P. Fields	Auburn	E G. Woodside	Lewiston	J. G Ham	Livermore Falls.
Cumberland County	Warren H. Vinton	Gray	D F. Whittier	Gorham.	Fred D. Scammon	Gorham.
Cumberland, North	Cyrus K. Foster	Harrison	Alfonso Moulton	Harrison	Joseph S Chaplin	Harrison.
Franklin County	M C. Hobbs	West Farmington,	Edwin A. Hall	Chesterville	Geo M Currier	Farmington.
Franklin, North	T. B Hunter	Strong	J. W. Butterfield	Phillips.	D. D. Graffam.	Phillips.
Kennebec County	Joseph B. Lowe	Readfield	Geo. E Coleman.	Readfield	Chas. H. Stevens	Readfield.
Kennebec, North	S. C. Watson.	Oakland	E. P. Wyman	Waterville	C. G. Carleton	Waterville.
Kennebec, South	Geo. Brown	Randolph	J. H Yeaton	Hallowell	J. S Gray	So Windsor.
Knox County.						
Knox, North	E H. Mero	Union	Fred E Burkett	Union	F. H Pratt	Union
Lincoln County	John W. Glidden	Newcastle	E. E Dunbar	Damariscotta	Geo. H. Weeks	Damariscotta.
Oxford County	A. F. Andrews	Norway.	A. C. T. King	South Paris	A C T. King	So. Paris.
Oxford, West	C. H Walker	Fryeburg	B W. McKeen.	West Fryeburg.	W. R. Tarbox	Fryeburg.
Oxford, North	Geo. O. Huse	Andover	John F. Talbot	Andover	Geo W. Abbott	Andover.
Oxford, Androscoggin Valley,	T. B W. Stetson	Canton	H T. Tirrell	Canton	H. T. Tirrell	Canton.
Penobscot County	J W. Green	Bangor	Geo N. Holland.	Hampden	Geo. M. Holland	Hampden.
Penobscot and Aroostook	John Burnham	Sherman	L B. Rogers	Patten	John Scott	Patten.
Penobscot, North	A. H. Lindsey	Carroll	Nathan Averill	Lee.	F. M. Johnson	Lee
Penobscot, West	John Rogers.	Stetson	C P Bachelder	Kenduskeag	C. P. Batchelder	Kenduskeag.
Piscataquis, East	Ira F. Hobbs	Milo	Walter H Snow	Milo	Walter H Snow	Milo.
Piscataquis, Central	A. M. Ayer	Dover	D. E. Dinsmore	Dover	D E. Dinsmore	Dover.
Piscataquis, West	Frank Hart	Howard	Edwin R. Haynes	Monson	Edwin R Haynes	Monson.

Sanford, Ag and Mechanics,	E. G Murray	Springvale	A. W. Low	Springvale.	I. A. Butler	Springvale.
Sagadahoc County	T. E. Skofield	Brunswick	W. S. Rogers	Topsham	L. E. Smith	Brunswick.
Somerset, East	J. P. Longley	Palmyra	G. M. Lancey	Hartland	S. L Mayo	Hartland
Somerset, Central	R. B. Shepherd.	Skowhegan	A. R. Smiley	Skowhegan	A. R. Bixby	Skowhegan.
Somerset, West						
Waldo County	S. T Edgecomb.	Belfast.	G G. Abbott	Belfast	A. S Redman	Belfast.
Waldo and Penobscot	C. A McKenney.	Monroe.	E. H. Nealley	Monroe	F. L. Palmer	Monroe.
Waldo, North	Jesse Smart	North Troy	J H. Cook	Unity	H. B. Rice	Unity.
Waldo, West	L C. Morse	Liberty	W. H Moody	Liberty	S T. Young	Liberty.
Washington County	Lyman G Smith.	Pembroke	H. F. Porter.	Pembroke	W. S. Allen	Dennysville.
Washington, West	James L Bucknam	Columbia Falls	E H Allen	Columbia Falls	F. L Allen	Columbia Falls.
Washington, Central	J. C. Talbot	East Machias	W. H Phinney	Machias	M. Gardner	Machias
Washington, North	Oscar Pike	Princeton	Willis R. Dresser	Princeton	S. G. Spooner	Princeton.
York County	John M. Deering	Saco	Asa L. Ricker	Biddeford	Geo. A Boothby	Saco
York, Buxton and Hollis	Andrew L. Berry.	Bar Mills	Ira W. Milliken	Hollis	James W. Meserve	Bar Mills.
York, Ossipee Valley	Howard Brackett	Cornish	James C. Ayer	Cornish	W P. Perkins	Cornish.
York, Ramshackle	C A. Goodwin	Woodman's, N.H	C L Wentworth.	West Newfield.	C. E Pinkham	West Newfield.
York, Shapleigh and Acton	Bodwell J Grant	Acton	Horace Bodwell	Acton	Howard A. Stanley	Shapleigh.

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1891.

Societies.	Amount of State bounty, apportioned 1891.	Amount received from State, 1892.	Receipts from membership for the year (annual and life).	Receipts from annual exhibition.	Receipts from loans.	Total receipts for the year.	Amount of entry fees received for trotting purses.	Amount awarded in trotting purses.	Total amount of premiums and gratuities awarded, including trotting purses.	Per ct. of pro rata discount made, if any, on premiums and gratuities awarded	Total amount of prem's and gratuities paid, including those uncalled for but still due	Amount expended during the year on improvements on grounds and fixtures.
Maine State Pomological	$500 00	$500 00	$61 00	$500 00	$252 30	$1,313 30	-	-	$562 00	-	$562 00	
Aroostook County....... ..	142 28	94 40	41 00	474 48	-	657 76	$ 77 00	$200 00	506 70	-	506 70	$ 12 00
Aroostook, North....	150 58	201 14	57 00	967 48	-	1,493 56	248 50	650 00	1,079 65	-	1,079 65	
Androscoggin County	382 56	440 60	54 00	2,264 35		2,700 91	799 10	1,650 00	2,365 00	-	2,365 00	200 00
Cumberland County..... ..	462 08	480 42	20 00	4,538 80	-	5,020 89	466 25	1,612 50	2,578 75	-	2,578 75	605 95
Cumberland, North	-	155 05	700 00	921 14	-	1,839 39	218 25	602 00	832 25	-	832 25	785 00
Franklin County	441 00	189 39	645 00	1,530 26	-	2,616 26	259 00	554 00	1,016 60	-	1,016 60	750 00
Franklin, North	67 27	84 02	240 00	479 39	200 00	986 66	89 00	250 00	451 00	-	451 00	60 00
Kennebec County...	222 16	205 51	-	1,777 46	-	1,999 62	195 00	437 00	1,103 10	-	1,103 10	150 00
Kennebec, North....	-	43 83		190 00	-	365 00	175 00	276 00	470 50	50	235 25	
Kennebec, South...... ...	80 39	92 49	138 00	1,210 86	-	1,429 25	110 00	278 00	496 48	-	496 48	374 19
Knox County........... ...	89 11											
Knox, North	69 57	64 91	275 40	218 00	2 36	565 33	-	-	348 40	-	348 40	
Lincoln County	155 44	120 13	28 00	846 00	-	1,029 44	170 30	395 00	644 85	-	644 85	33 50
Oxford County..	430 39	380 77	15 00	5,000 85	4,460 00	9,996 24	329 75	986 00	2,043 85	-	2,043 85	4,983 66
Oxford, West	249 84	208 01	67 00	1,780 00	-	2,340 80	278 80	563 00	1,116 70	-	1,116 70	377 17
Oxford, North, Andover.. ...	91 34	83 24		731 54	7 91	830 79	84 50	302 00	446 80	-	446 80	150 59
Oxford, Androscoggin Valley,	216 15	244 07	17 00	1,619 23	-	1,852 48	373 00	830 00	1,313 10	-	1,313 10	194 40
Penobscot County...	14 23	-	-	209 50	-	223 73	-	425 00	665 50	100	-	425 00
Penobscot and Aroostook...	100 00	100 00	168 00	568 68	2,000 00	2,836 68	107 25	332 50	492 20	-	492 20	1,677 58
Penobscot, North...	122 47	176 33	14 00	423 50	-	559 97	372 00	817 00	946 50	-	946 50	
Penobscot, West	382 89	410 71	167 00	1,650 00	-	2,199 89	582 50	1,707 50	2,204 55	-	2,204 55	900 00

Piscataquis, East........ ...	9 00	8 15	-	35 00	14 00	58 00	3 00	3 00	43 75	-	43 75	
Piscataquis, Central.........	60 20	79 41	125 00	291 33	200 00	676 53	58 70	171 00	426 05	-	426 05	32 80
Piscataquis, West	20 59	13 68	38 00	38 70	-	97 29	5 00	8 00	73 45	-	73 45	
Sagadahoc County	430 00	416 04	70 00	3,893 92	1,125 00	5,518 92	635 00	1,170 00	2,233 18	-	2,233 18	1,968 62
Somerset, East.............	192 20	163 74	93 25	1,155 77	-	1,632 72	191 50	618 50	878 90	-	878 90	342 23
Somerset, Central.	152 36	160 78	44 00	731 90	-	928 26	-	375 00	863 00	-	863 00	100 00
Somerset, West.............	57 55	71 07	14 00	218 64	-	376 14	157 50	300 00	381 50	-	381 50	15 88
Waldo County	223 00	118 21	-	810 00	-	1,033 00	85 75	380 00	705 00	10	634 50	360 00
Waldo and Penobscot	250 00	250 00	-	2,735 52	9 00	2,994 80	385 00	695 00	1,291 75	-	250 00	520 50
Waldo, North	100 97	82 70	-	601 87	-	702 84	-	234 00	443 90	-	443 90	
Waldo, West	-	88 77	-	456 77	-	459 12	102 55	354 00	476 50	-	476 50	180 60
Washington County	200 00	194 22	3 00	1,681 75	-	1,884 75	270 00	565 00	1,042 55	-	1,042 55	
Washington, West	291 42	272 47	1 00	2,437 21	-	2,729 73	194 50	536 00	1,462 20	-	1,462 20	295 66
Washington Central.........	221 93	209 31	9 00	1,444 25	-	1,675 18	233 00	530 00	1,123 55	-	1,123 55	
Washington, North..	142 00	139 08	-	1,152 59	700 00	1,994 68	173 00	437 00	746 53	-	746 53	800 00
York County...	248 00	337 53	-	1,668 09	500 00	2,416 09	593 75	1,460 00	1,811 75	-	1,811 75	
York, Buxton and Hollis ...	200 04	166 03	-	2,025 17		2,225 21	307 00	685 00	891 20	-	891 20	111 07
York, Ossipee Valley	200 00	200 00	-	2,413 26	-	2,613 26	391 50	1,065 00	1,461 00	-		50 00
York, Ramshackle	126 66	81 42	-	804 53	-	931 19	100 50	292 00	437 05	-	437 05	335 00
York, Shapleigh and Acton..	161 07	170 36	196 00	770 00	137 00	1,264 07	240 00	500 00	914 45	-	914 45	500 00
York, Sanford Ag. & Mech...	-	159 37	-	1,919 27	-	1,919 27	36 25	435 00	855 45	-	855 45	100 00

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1891—*Continued.*

Societies.	General expenses of society during the year.	Total amount paid out during the year.	Value of property belonging to Society.	Amount of liabilities of Society.	Amount awarded for plowing	For bulls and bull calves.	Working oxen, 4 years old and over.	Steers under 4 years old.	Am't awarded for cows.	For heifers and heifer calves.	Amount awarded for fat cattle.	Amount awarded for stallions.	Amount awarded for breeding mares.	For other horses and colts.
Maine State Pomological.....	$765 87	$1,327 87	$679 90	$250 00										
Aroostook County....... ...	133 93	643 38	380 00	190 00	-	$20 00	$ 5 00	$2 00	$30 00	$31 75	-	$ 18 50	$8 00	$15 00
Aroostook, North	372 00	1,451 65	1,000 00	-	-	17 00	11 50	4 00	36 00	31 75		14 00	15 00	56 00
Androscoggin County	213 00	2,775 00	1,200 00	1,090 00	-	25 00	40 00	40 00	60 00	40 00	$9 00	33 00	18 00	56 00
Cumberland County	847 52	4,032 22	3,000 00	400 00	-	41 00	261 00	20 00	48 00	40 00	13 00	46 00	12 00	124 00
Cumberland, North...... ...	159 68	1,776 93	1,500 00	168 75	-	6 00	60 00	21 00	15 00	10 00	6 00	-		40 00
Franklin County	950 00	2,716 60	10,000 00	-	-	24 50	20 00	18 00	32 00	26 50	8 50	25 00	12 00	42 00
Franklin, North.......... ...	175 88	776 88	1,200 00	-	-	10 50	34 00	23 25	12 00	12 15	5 25	6 00	4 50	18 10
Kennebec County	459 68	1,712 78	1,650 00	257 50		22 50	81 00	39 50	41 00	47 50	7 50	22 00	6 00	51 50
Kennebec, North	50 00	285 25		-	-	6 00	9 00	17 50	8 00	10 00	10 00	15 00	6 00	18 00
Kennebec, South	496 86	1,367 53	1,250 00	-	-	2 50	39 25	16 50	11 65	7 50	3 50	12 65	3 50	14 95
Knox County														
Knox, North	379 98	728 38	10 00	-	-	10 50	25 50	24 50	18 50	20 00	7 50	5 00	6 00	39 50
Lincoln County.	413 96	984 27	1,500 00	430 00	-	14 00	41 00	13 00	15 00	6 50	3 00	21 00	5 00	10 25
Oxford County.............	2,287 28	9,314 79	10,000 00	4,460 00	-	101 00	53 00	103 00	84 00	114 00	6 00	74 00	27 00	66 00
Oxford, West.......	249 25	1,743 12	6,150 00	2,000 00	-	36 00	34 00	33 50	18 00	26 00	7 00	19 00	6 00	71 00
Oxford, North, Andover.....	176 45	773 84	1,491 00	-	-	5 50	3 00	1 75	10 00	8 60	3 00	5 00	3 50	7 15
Oxford, Androscoggin Valley,	236 80	1,744 86	1,625 00	2,491 97	-	30 00	56 00	52 00	51 00	25 00	10 00	53 00	23 00	48 00
Penobscot County..........	225 06	225 06		34 00	-	5 00	-	-	9 00	5 00	-	12 00	13 00	20 00
Penobscot and Aroostook	22 50	2,192 43	4,000 00	2,000 00	-	4 00	4 50	6 50	4 50	5 50	-	6 00	12 00	26 50
Penobscot, North...........	48 00	549 50	10 00	-	-	3 00	8 00	1 50	6 50	6 00				
Penobscot, West...........	262 79	1,937 10	2,000 00	-	-	41 00	11 00	18 00	36 00	29 00	3 00	27 00	15 00	61 50

Piscataquis, East	17 90	61 65		-	-	-	2 00	75	2 50	1 00	-	2 00	3 00	17 75
Piscataquis, Central	108 75	592 40	300 00	285 40	-	14 50	34 00	8 50	27 00	8 00	9 00	13 00	12 00	33 50
Piscataquis, West	33 50	106 95		-		2 00	4 50	1 25	2 00	1 75	-	2 00	4 00	20 00
Sagadahoc County	1,035 16	5,236 96	5,000 00	1,600 00	-	43 00	108 00	49 00	53 00	69 00	9 00	25 00	19 00	56 00
Somerset, East	354 54	1,575 67	4,700 00	2,100 00	-	13 00	15 00	14 25	15 00	13 00	4 50	18 00	12 25	37 25
Somerset, Central	235 17	1,198 17	2,500 00	259 91	-	27 00	60 00	16 00	25 00	53 00	12 00	56 00	18 00	64 50
Somerset, West	95 25	445 70	1,000 00	500 00	-	2 00	28 00	-	3 00	2 00	7 00	5 00	6 00	18 00
Waldo County	65 00	1,075 00	3,500 00	-	-	11 50	35 00	13 50	28 00	25 00	5 00	9 00	4 50	34 00
Waldo and Penobscot	749 00	2,561 25	3,500 00	-	-	27 50	50 00	22 00	33 00	24 00	18 00	55 00	15 00	110 00
Waldo, North	155 10	621 30		-	-	11 00	9 00	11 00	6 00	2 80	2 00	24 00	60 00	20 25
Waldo, West	153 12	820 28	1,500 00	-	-	-	-	3 00	3 00	1 00	-	5 00	4 50	
Washington County	716 55	1,769 10	1,800 00	-	-	18 00	7 00	18 00	23 00	36 00	8 00	18 00	16 00	56 00
Washington, West	651 25	2,409 11	1,600 00	-	-	39 00	24 00	41 00	40 00	35 00		92 00	24 00	81 00
Washington, Central	441 69	1,565 24		725 00	-	21 00	20 00	15 00	26 00	33 00	-	32 00	13 00	64 00
Washington, North	448 13	1,994 68	2,800 00	1,700 00	-	10 00	12 00	10 00	18 00	27 00	-	15 00	12 00	42 00
York County	626 27	2,43[illegible] 02	2,000 00	500 00	-	17 00	132 00	5 00	13 00	7 50	6 00	-	6 00	38 00
York, Buxton and Hollis	490 69	2,102 28	3,500 00	1,602 30	-	8 00	26 00	16 00	18 00	14 00	3 00	8 00	5 00	20 00
York, Ossipee Valley	471 20	3,614 01	5,500 00	1,518 74	-	24 00	76 00	53 00	36 00	25 00	4 00	30 00	8 00	105 00
York, Ramshackle	325 00	1,097 05	2,500 00	165 86	-	8 75	12 50	10 00	6 00	4 00	6 00	16 00	6 00	21 50
York, Shapleigh and Acton	27 50	1,451 05	7,000 00	-	-	7 50	102 00	12 75	14 50	7 75	7 00	2 00	3 50	20 00
York, Sanford Ag & Mech	400 00	1,367 45	6,000 00	-	$18 00	21 00	53 00	37 00	27 00	16 00	6 00	14 00	4 00	53 00

FINANCIAL STATEMENT OF AGRICULTURAL SOCIETIES FOR THE YEAR 1891—*Continued.*

Societies.	For swine.	For sheep.	For poultry.	Total amount awarded for live stock.	Total amount awarded for horses—not purses.	For turnips.	For herds.	For cabbage.	For squashes.	Total amount awarded for grain and root crops	Am't awarded for any other cultivated crops.	For fruits and flowers.	Bread, honey, sugar and syrup.	For butter and cheese.
Maine State Pomological.														
Aroostook County	$10 00	$28 25	$31 25	$158 25	$71 50			-	-	$21 50	$4 05	$16 30	$ 1 75	$ 7 75
Aroostook, North	5 00	15 50	-	120 75	85 00	-	-	-	-	21 00	31 00	40 90	11 50	16 25
Androscoggin County	4 00	18 00	10 50	342 50	107 00	-	-	-	-	43 00	17 00	60 65	8 25	20 00
Cumberland County	7 00	43 00	75 50	584 50	182 00	-	-	-	-	4 00	3 00	46 25	5 75	11 00
Cumberland, North	-	1 00	15 00	134 00	40 00	-	-	-	-	6 00	-	12 00	1 75	5 50
Franklin County	5 00	98 00	27 75	239 75	79 00	-	-	-	-	4 45	14 00	29 25	2 40	10 00
Franklin, North	-	13 50	2 35	113 00	28 60	-	-	-	-	10 35	3 90	9 00	80	2 50
Kennebec County	6 00	22 50	14 50	282 25	89 50	-	-	-	-	23 50	9 00	59 00	3 75	45 00
Kennebec, North	2 00	9 00	-	71 50	39 00	-	-	-	-	16 75	-	22 25	4 50	3 00
Kennebec, South	1 00	2 75	2 15	86 45	31 10	-	-	-	-	30 25	4 15	11 40	1 25	9 25
Knox County														
Knox, North	4 00	3 75	2 25	115 50	44 50	-	-	-	-	18 00	3 50	30 75	12 50	13 25
Lincoln County	4 00	9 50	1 50	107 50	36 25	-	-	-	-	20 50	2 75	26 75	2 50	5 75
Oxford County	16 00	46 00	19 50	577 50	167 00	-	-	-	-	30 75	-	56 75	16 50	29 00
Oxford, West	-	4 00	4 75	242 75	96 00	-	-	-	-	26 50	10 50	12 75	17 25	19 50
Oxford, North	2 00	9 00	3 50	47 35	15 65	-	-	-	-	6 30	-	4 30	4 00	15 50
Oxford, Androscoggin Vall'y,		19 50	7 00	250 50	124 00	-		-	-	9 35	17 50	26 65	5 75	3 05
Penobscot County	2 00	-	-	23 00	45 00	-	-	-	-	50 80	12 25	28 10	2 00	
Penobscot and Aroostook	3 00	15 50	1 25	44 75	44 50	-	-	-	-	14 30	-	18 75	1 40	6 75
Penobscot, North	3 00	-	1 75	29 75	34 50	-	-	-	-	8 50	6 00		9 45	25 75
Penobscot, West	8 00	22 00	11 70	200 20	103 50	-	-	-	-	20 30	6 10	19 15	1 00	10 00

Piscataquis, East	2 00	4 00	25	6 25	19 75	-	-	-	-	3 00	75	1 25		
Piscataquis, Central	7 00	14 00	7 00	111 00	53 50	-	-	-	-	5 29	3 50	8 50	7 50	10 00
Piscataquis, West..........	-	2 50	50	14 50	26 00		-	-	-	1 30	20	3 30	-	2 25
Sagadahoc County	18 00	26 00	46 50	421 50	100 00	-	-	-	-	61 25	72 75	76 25	8 25	26 00
Somerset, East.	9 50	23 50		175 25	67 50		-	-	-	-	7 40	2 70	10 00	20 25
Somerset, Central..........	2 00	51 00	26 50	272 50	139 00	-	-	-	-	17 75	-	20 75	3 00	11 00
Somerset, West	-	9 00	1 50	42 00	29 00									
Waldo County	6 00	11 00	8 00	143 00	47 50	-	-	-	-	28 75	2 25	17 00	2 00	6 00
Waldo and Penobscot.......	11 00	22 00	21 00	228 00	180 00	-	-	-	-	38 50	4 50	21 75	1 50	9 00
Waldo, North	1 00	10 75	2 90	56 15	50 25	-	-	-	-	24 00	3 00	9 75	13 50	2 00
Waldo, West	-	2 00		-	50 00									
Washington County	9 00	19 00	17 50	155 50	90 00	-	-	-	-	69 50	-	34 20	3 25	11 25
Washington, West	8 00	26 00	20 00	233 00	197 00	-	-	-	-	92 75	17 85	37 00	5 00	25 00
Washington, Central.	9 00	15 00	15 25	154 25	109 00	-	-	-	-	65 25	3 50	21 65	3 65	6 00
Washington, North	7 00	9 75	9 75	103 50	69 50	-	-	-	-	33 25	3 70	7 00	2 50	3 25
York County.	3 00	2 00	42 50	228 00	44 00	-	-	-	-	19 50	-	11 75	-	3 00
York, Buxton and Hollis...	3 00	3 00	4 00	95 00	33 00	-	-	-	-	14 75	-	5 00	3 00	3 00
York, Ossipee Valley......	-	-	3 00	221 00	143 00	-		-	-	5 00	-	4 25	1 50	1 00
York, Ramshackle..		2 50	50	47 25	46 50	-	-	-	-	8 00	3 50	1 50	1 25	3 00
York, Shapleigh and Acton..	6 00	5 25	15 25	177 00	25 50	-	-	-	-	44 00	4 75	6 00	4 00	7 50
York, Sanford Ag. & Mech.,	12 00	8 00	15 00	213 00	71 00	-	-	-	-	29 50	-	8 25	4 35	

Financial Statement of Agricultural Societies for the Year 1891—*Concluded.*

Societies.	For agricultural implements.	Household manufactures and needle work.	Manufactures of wood, iron and leather.	For mechanical products.	For all objects not enumerated above.	Number of bulls and bull calves	Number of cows.	Number of heifers.	Number of heifer calves.	Number of working oxen, pairs.	Number of steers, pairs.	Number of fat cattle.	Total number of cattle exhibited.	Number of horses and colts.	Number of sheep.	Number of swine.	Number of poultry, coops.
Maine State Pomological																	
Aroostook County	-	$20 95	$5 00	-	-	12	12	16	9	2	1	-	54	71	53	5	41
Aroostook, North	-	26 55	-	$14 95	$ 61 75	13	37	21	11	5	4	-	100	88	39	12	
Androscoggin County	$8 00	49 50	2 00	1 50	151 60	18	22	3[illegible]	12	60	34	7	282	128	46	10	21
Cumberland County	-	28 75	-	-	147 00	17	19	23	8	23	7	6	133	127	29	12	66
Cumberland, North	-	10 00	-	-	15 00	6	18	9	-	25	21	6	137	66	1	-	9
Franklin County	30 00	33 00	3 75	5 00	12 00	15	26	31	9	21	30	8	325	52	232	5	24
Franklin, North	-	25 40	-	-	7 50	7	15	13	3	37	18	6	154	50	52	-	5
Kennebec County	-	66 00	75	-	87 35	17	57	56	18	43	23	8	222	137	47	8	43
Kennebec, North	-	2 00	-	-	26 00	4	6	5	3	4	6	5	33	40	30	6	
Kennebec, South	-	35 70	-	-	7 43	3	7	7	1	57	22	6	170	86	8	10	6
Knox County.																	
Knox, North	2 00	63 50	1 50	13 25	30 15	12	27	14	7	14	10	7	115	72	44	28	5
Lincoln County	50	19 35	-	-	28 00	6	17	11	1	19	11	2	67	36	5	5	4
Oxford County	6 00	28 90	10 35	18 10	123 00	26	42	57	14	20	32	2	269	61	91	3	37
Oxford, West	15 00	66 70	-	-	46 75	21	16	20	9	45	32	8	235	65	10	-	4
Oxford, Androscoggin Valley,	5 00	13 85	7 00	-	9 76	10	65	28	18	38	40	10	207	107	35	-	12
Oxford, North	6 00	14 70	-	-	39 45	6	13	13	2	8	3	4	39	30	20	1	4
Penobscot County	-	13 90	-	-	66 25	7	13	8	-	-	-	-	28	42	-	2	
Penobscot and Aroostook		22 45	-	-	8 50	4	5	6	5	3	4	-	27	49	47	1	4
Penobscot, West	9 00	66 10	3 00	7 50	47 00	21	19	29	10	15	16	-	147	132	116	10	12
Penobscot, North	1 00	15 75	-	-	23 10	3	10	7	2	2	2	-	25	45	-	2	2

Piscataquis, East..........	-	-	-	-	-	-	5	1	-	1	1	-	9	15	7	1	1
Piscataquis, Central..........	2 50	24 50	1 00	-	5 30	10	18	6	3	25	7	12	81	86	38	2	17
Piscataquis, West..........	-	2 20	-	-	23 70	3	17	8	2	2	4	-	45	41	35	-	1
Sagadahoc County..........	-	67 50	2 00	-	227 68	14	55	47	16	20	21	8	222	75	64	10	44
Somerset, East..............	-	34 95	-	-	9 85	7	16	17	3	12	9	4	68	50	59	3	
Somerset, Central	-	5 00	8 00	2 00	9 00	10	12	25	10	40	6	8	157	79	62	5	31
Somerset, West..............	-	-	-	-	-	1	1	1	-	16	-	4	21	43	19	-	2
Waldo County	12 00	33 00	-	5 00	28 50	6	37	16	4	12	7	6	89	60	20	6	8
Waldo and Penobscot	-	85 75	2 00	-	25 25	10	17	20	12	18	7	9	130	85	48	8	75
Waldo, North.......	-	20 25	-	-	31 00	4	15	2	-	25	10	4	60	60	40	6	4
Waldo, West.																	
Washington County	-	81 75	6 00	-	17 00	7	12	15	11	2	14	6	66	49	35	21	19
Washington, West...........	-	76 75	12 00	23 75	206 10	6	13	9	3	10	12	-	75	54	22	7	20
Washington, Central	-	70 25	19 25		140 00	6	15	13	8	4	7	-	64	54	19	14	23
Washington, North	-	52 45	-	-	34 00	5	16	10	4	2	5	-	49	37	19	18	19
York County................	-	46 50	-	-	7 00	6	3	2	3	44	4	8	106	17	2	5	23
York, Buxton and Hollis.....	-	32 45	-	-	-	15	45	38	12	18	16	6	184	35	30	6	8
York, Ossipee Valley	-	20 30	-	-	-	13	35	25	11	65	51	16	332	-	-	8	6
York, Ramshackle	-	24 30	-	10 00	-	12	20	25	8	40	25	20	215	300	15	-	10
York, Shapleigh and Acton...	-	85 25	-	-	59 50	7	15	22	2	70	16	10	244	27	10	7	16
York, Sanford Ag. & Mech...	-	56 35	13 00	-	-	6	20	10	5	33	26	8	177	28	20	10	12

STATE DAIRY CONFERENCE,

AT CITY HALL, AUBURN, TUESDAY, WEDNESDAY AND THURSDAY, JANUARY 26, 27 AND 28, 1892.

WEDNESDAY, 10 A. M.

Meeting called to order by the President, Mr. Briggs, and adjourned to 1.30 P. M.

WEDNESDAY, 1.30 P. M.

Meeting called to order by the President,

Ladies and Gentlemen: I am glad to see so many of the farmers of Androscoggin county and of the State, present as I see here. I am glad to welcome you all to our city, for we take great pride in the city of Auburn. We are proud of its churches, its schools; we are proud of its manufacturing industries; we are proud of our hotels, run on strictly temperance principles; we are proud that we can boast of no grog shop within our borders. We do not need them, there are plenty just across the way.

We are proud also of our Mayor, who not only has an eye to the best interests of our city along these lines, but is ready to do what he can to serve the interests of agriculture in our State.

Ladies and gentlemen, let me introduce to you our Mayor, Hon. A. R. Savage.

ADDRESS OF WELCOME.

Mr. Chairman, Ladies and Gentlemen:

I noticed in the paper the other night, that Mr. Briggs of Auburn, who always spoke well, was developing into a public speaker. I am glad to hear this exhibition of his powers as a speaker. He asked me to come and welcome the members of the Board of Agriculture and others who are assembled here, to the city of Auburn, and I assure you Mr. President it gives me great pleasure in behalf of the city to extend to you all a cordial welcome to our hearts and our homes.

I am proud to know that the city of Auburn, although ranking the oldest in the State as a thrifty, energetic manufacturing town, is also a marked agricultural town.

Yesterday, I chanced to be at a meeting of the Board of State Assessors and there ascertained that the particular interest for which you are assembled to-day, was represented by the city of Auburn to a larger degree than any other town in the State.

Besides that, that the assessed value of the cows was higher than any other town in the State. We are in the centre of a thriving dairy industry, and I am glad to welcome you because as I remember back to the years when I was upon the farm, twenty-five years ago and remember the methods pursued by farmers in those days and follow up the improved methods by which the farming industry has been gradually advanced, I think it is a matter of pride to those engaged in that occupation, a matter of pride to us all, that the industry that is at the foundation of all our other industries should have received that intelligent attention which it ought.

In my boyhood days when I worked upon the farm, there was a period when I was not personally in favor of farming. In those days, special farming. scientific farming was comparatively unknown. Not only that. but I remember good old farmers in my neighborhood were inclined to look with suspicion on any man who farmed by a book or studied chemistry in connection with farming, and on everything that bore on research for methods to get the best results.

About that time there began to be a change. Those things which I saw about the farming industry at that time, were undoubtedly true to a large part of the industry; but since that time we have been improving very rapidly, as much so in agriculture as in any other lines, until to-day you meet in State and county convention, you examine and determine methods, demonstrate operations and you are putting agriculture where it belongs, in the front rank of intelligent work. So for *that* reason, I am glad to welcome you to our midst, among our farmers who I am proud to say are among the foremost farmers of the State in this work.

I am not to make a speech on dairying, I am to go to the State House to act on the water question. There is a direction where the dairy and water question are somewhat assimilated, so my work will be harmonious with yours.

I hope this meeting will be an advantage to the dairy industry of Auburn; I hope each session will be pleasant and profitable and I am sure that in the hands of the gentlemen and ladies who are engaged in this work there will be an ever increasing power.

It is wonderful to me, as I go up and down the State, as I have in the last year, having been connected with public affairs, to get at the influence which any body of men exercise on public opinion when their minds and purposes are united. I met a good many of you at the Legislative Halls in your interest. You were not able, *we* were not able,—I believe as far as I could, my thoughts run in the same line with yours to secure what we desired in the way of legislation on all that we asked. But there was one thing done; and that was the demonstration that when a vast body of men, like those representing the agriculture of Maine, are united, they will be heard. It is only a question of time when their demands will be answered by the law-makers.

Thanking you for the attention you have given me, again let say that all we have is *yours*, take it, *use* it.

THE BUSINESS SIDE OF THE CREAMERY.

By Hon. E. R. French, Chesterville.

No more marked change in connection with the labors of the farm, has been observable of late years, than what is taking place in dairying. Once butter and cheese of some kind or quality were considered to be an indispensable product of every farm; at least so far as the wants of every farmer's family were concerned. A few who had the ambition to excel, made a specialty of it and got for themselves or their community a reputation for their butter or cheese-making which became remunerative. The rule, however, was that the surplus, large or small as the case might be, went to the nearest grocery store to become a part of the heterogeneous mass that was put upon the general market; good and poor alike together, and often in anything but a tempting condition to the consumer.

This state of things no longer exists. The cheese factory has been in our midst a score of years, and now the butter factory is taking the place of private dairies. It has come to stay, and will multiply until the entire product of butter that is offered for sale will be made at the creamery; first, because of the evenness and superior quality of its manufacture, and, second, that the labor hitherto supplied by human hand is largely supplemented by machinery, thus relieving the farmer's family in a measure of what by reason of insufficient help, had become an onerous labor. Once the change accomplished and the former condition of things *will not* be reinstated.

Already consumers refuse the ordinary make of dairy butter; they call for the creamery, and the call is going to be answered.

Cheese making from the beginning has been conducted on business principles. What can be fairer than that each patron shall deliver milk of a standard quality at the cheese-factory to be weighed as is each lot, and at the end of the season, receive his proportionate part of the cheese, or what it has brought, deducting the expense of making. This method has been eminently satisfactory as each one supplying milk was allowed to take back his proportionable part of the whey if he choose to. Generally, too, the cheese-factory has been built and operated by close corporations, whose interest it was to meet the reasonable demands of the business and patrons, while having an eye to a proper return for the capital invested. By this system of operations every man's farm is of greater or less value according to his convenience to the factory, which is in fact his market.

The butter making business as a rule has been carried on on a different principle, viz., by an extension of the co-operative plan to include the communistic idea of making things equal, by setting the butter factory down at every farmer's door. This in the end proves to be very unequal, and affords an opportunity for endless bickerings and jealousies.

Co-operation is a failure, unless the many are as one, except as a sort of charitable institution. As applied to the creamery, it means that each man's cows be as good as any others of whom he is a part; that they be as well fed and like fed; that the cream product be reckoned on the same basis, and by the same measurement. These are conditions that do not exist, we venture to say, in connection with any butter factory in this State, however near to it some may come.

It may be said in reply to this "Let every man's cream be tested and paid for accordingly." Yes, this is very fine and all right in theory, but still disappointing in practice besides being fruitful of much ill feeling. The poor cream that you have paid for at a reduced rate, never comes to time in the churn, or if it does only to deteriorate the whole mass. Every dairyman knows that it is essential to the highest production that his cows' milk rise cream of like globularity and quality. Cream that requires from one to two hours churning to make butter is practically lost in the butter product when mixed with that that is less than an hour in churning. The butter-milk gets the benefit of the mixing instead of the butter-tub. What is true of one man's experience is equally true of the creameries; as is evidenced by the large per cent of cream that it takes to make a pound of butter when compared with the result obtained by individual patrons.

To whatever extent the quantity of the cream product is affected by the fitness of the cow, or the kind and manner of feeding, the result is felt in the butter factory. This is especially observable when the cows are all out to grass and receiving little or no grain rations. No methods of feeding practiced have been found to quite equal the fresh June grass. When there is good grass and good water, and the cow can help herself to what she likes best and as much of it as she pleases, she gives the best results at home or at the factory.

If these conditions could be continued in the stall, much of the vexation and unsatisfactory results now complained of would be avoided. It is practically impossible to do this under ordinarily existing circumstances, and the selfishness of patrons makes it still more difficult of attainment.

It is claimed that by the separator system of producing cream, much of this unevenness of cream product can be overcome, as frequent testing of the milk will afford a basis on which to reckon each man's supply according to the quality of the milk offered. As a rule, the dairy business of Maine is not yet in a condition to use the separator to advantage. The cows are scattered over too wide an area. There is probably not a butter factory in operation whose collecting routes are less than fifty miles in extent, while not a few are seventy-five and even 100 miles of travel. The only feasible method is by establishing separator stations, but each of these will cost a thousand dollars, or half as much as is required to build and equip a good butter factory. For the present, at least, the deep setting method of raising cream must be practiced among us.

Like difficulties do not attend the manufacture of cheese for the reasons first that the proportion of caseine in milk varies but little in comparison with that of butter fat, and second that each patron delivers his milk at the factory where all is weighed alike. It is claimed by some that this method should be applied to collecting cream, and is, I think, practiced at some butter factories; each patron's product being brought in separately, tested and weighed on delivery, but even this is not free from objection, as it only applies to amount, not to quality.

There is no way to make co-operation an equality but as already stated: that the many shall be as one in their entire product. Butter making by the separator method avoids many of these objections, but not all; unless it is assumed, as some affirm, that an inch of cream is an inch of cream, regardless of breed or feed, this we positively deny.

The real business-like way to carry on the "associated dairy" is for a few men who have the means and ability to do so, or even one man if he is so disposed, to form a company with members enough to take charge of the separate branches of the work. This is already being done in some sections of the State, and the results are showing the wisdom of the plan. By this means business methods are applied to each department of the work; economy of both time and capital is secured. and being accountable to no one but themselves, they are able to make and carry out such rules as seem to them best suited to their business. The fact that what is good for one is good for all, is a conservator of their action, and a guaranty that the interest of all will be subserved.

Those willfully selfish or dishonest, or who do not keep proper dairy cows can be dealt with summarily, and if obstinate left out entirely, the same as a man is who offers an inferior article of merchandise for sale in the markets. There are some persons whose preceptions of what pertains to commercial integrity is so obtuse that only heroic treatment will help their infirmity. Touch their pockets and you will incite in them some degree of moral sense. When subjected to fair and honest deal in practice, they are ready to exclaim with the Dutchman who was analysing Gov. Hoard's test record in the butter factory: "Mien Got! Mien Got!? vat ist som on boy."

There is another feature of associated dairying in which morality plays an important part, but is not as easily interested, viz: the observance of the conditions by all patrons necessary to secure the *best* reputation. Thus far individual or private dairies have been able to command the highest prices in the market, and will continue to do so until all are inspired as are a few in the practice of absolute neatness in every detail, which condition cannot be reasonably expected until some radical changes take place in human nature. Gilt edged butter comes of gilt edged methods. The butter maker cannot make it at pleasure, the end is only reached from the beginning. The one-half may attend to all the requirements necessary to produce it, but the shiftlessness of the other half animated by the thought that they shall get just as much, neutralizes the strict attention of the other half and degrades the whole product. As a rule, instruction begins at the wrong end of the course. The first lessons should be given in the stable beside the dairy cow.

I will not forbear to allude to what is practiced by some in connection with their milk and cream production, especially the latter. I mean the use of highly concentrated and stimulating foods that excite the animal's productive powers to the utmost. It is just as wicked to milk a cow to death as it is to work an ox or drive a horse to death. It is more so; for it is not the muscular or secretive powers of the cow alone that is overstrained; her product as an article of human food is injured. The unnatural, fevered state of the animal gives forth a fevered product, and although the evil results may not be seen, the consequences are not to be avoided. A man working under the influence of alcoholic stimulants may be able to do an undue amount of work for the time being or undertake extra hazardous performances, but the compensations due to this will surely follow.

It should not be forgotten that for six months of the year, in this latitude, our cows live artificially, and the constant aim of the good husbandman to make it as nearly like their natural life as is possible to do. To take advantage of this forced condition of the animal to force them still further until their constitution and productive powers are broken down for the sake of larger present returns to satisfy our greed and avarice, is simply execrable. You may do it with what grows from the soil, as your orchard for instance, but to apply the same principle to animate beings as to inanimate, to deal with animal tissues as with soil, is wrong from every point of view. It is a fit subject for investigation by health commissioners.

We have stringent laws against the sale of tainted or diseased meats, why not for unhealthy milk or the butter or cheese that is its product.

The green grass state of June pastures is rarely excelled by any artificial feeding. The milk product at this season is excessive and generally satisfies the most grasping, yet the conditions are natural to the animal; life giving and health giving, if the change from the barn to the pasture has not been too sudden. Because an article of feed like cotton seed meal is a powerful stimulent to cream production is not a valid reason why it should be used to an unlimited extent. Yet there are those who tell us that the larger the proportion they give of it, the more profit. No man has any more right to break down or destroy the life of an animal created for certain purposes, and which may be committed to his care for the time being than he has to take his own life because he is tired of it and of the world.

We hear much said late years about the necessity of warm stalls for cows, and indeed for all animals, and almost every farmer is endeavoring to improve his barns in this direction. A great improvement as regards the animals housed has been made, but there is danger in it. Close stalls without proper ventilation are debilitating. When you step into your stable or tie-up, and there meets you a fetid atmosphere made up of the breath of the animals therein and the stench of their odor, be assured there is something wrong however comfortable it may seem. Open the doors, open the windows, but better still, make a ventilator. I have observed that the dreaded "tuberculosis," a disease of civilization, is chiefly to be found among high bred, tenderly cared for animals, rather than to those more exposed. What is true in the human family is true of animal health. Make your barns warm, keep out currents of air, but provide for the exit of foul air and odors.

The making and marketing of butter at the creamery are two prime essentials. The individual instances of success in private dairying came because many families of refined and cultivated tastes spurned the uninviting compounds—good, bad and indifferent all combined—which under the grocery system was put upon the market, or that middle men gathered up in the fall or early winter every year.

They wanted to know who made their butter, and when it was made, and were willing to pay for a good article thus assured. These extra prices and the reputation that came because of the skill some manifested in their product inspired not a few. Good butter was made and eaten before the creamery was built, but in a general way it was likely to get into bad company. The same principle in production applies to the creamery as to the private dairy. The consumer is always seeking for the best, and, if he has the means to gratify his desires, will have it.

It is one thing to make a good article and another to sell it. Much depends upon the presentable appearance of your goods when placed upon the market. People must learn to want your make and be satisfied with no other. This applies to butter making and butter selling in an eminent degree. Defects in butter, be it in quality or appearance are so manifest even to ordinary taste, that it is subjected to a closer scrutiny than most food products. The fact that it is creamery made and creamery sold will soon wear off, and the question of what creamery is next to be asked, as formerly "what dairy." Not many years ago Livermore cheese was the synonym of the best article in the market hereabouts, and to-day if a grocery man has a really good article you are liable to find that label on it without reference to where or by whom it was made.

To-day Deerfoot Farm is a trade-mark of "par excellence." Every creamery should have a trade-mark of its own of equal significance. The grocer man and commission merchant will look in upon you some day, and the appearance of your factory will thereafter have quite as much to do with the sale of your goods as the mould you print them in.

Not every man, nor every woman for that matter, is a good butter maker, and woe to the creamery that makes and offers for sale an ordinary article. Its quality will be known in the market, despite evenness of make and a liberal use of butter color. Some have an aptitude to discern the essentials in the manufacture of good butter, that others *do not* possess; and any amount of practice does not enable them to acquire. It is so in all trades, and this is what determines the quality and value of manual labor.

The proper ripening of the cream, the perfect granulation in the churn, the working to dryness without destroying the "grain" are delicate operations not to be performed by rude hands, or apprehended by dull intellects. Butter making is an art production, though the butter maker may have no skill with brush or pencil. The senses that enable one to discern the "real" in its work are artistic in the highest degree.

Prices in the market will take care of themselves if you have what is wanted and there is not an over-production. The law of supply and demand however is inexorable and cannot be cheated out of its say in the marts of the world. To meet this exigency I claim that cheese making should be combined with butter making for at least three months of the year. The extra expense for appliances will be slight, and the advantages by reason of the evening of production great.

A year ago I raised the question of "How long shall we be able to hold the price of butter so much above the average of food products." It is asserted that a pound of butter can be made as cheaply as a pound of beef, and I think the assertion correct, yet the average price of butter is four times that of beef.

The creamery business is yet in its infancy, and its products are not yet equal to the demand. When this point shall be reached by reason of the universality of the method of making, butter will have a ratable value in comparison with other food products. When this point is reached however, the consumption will be vastly increased, in consequence of the increase of consumers, and the education of tastes that are to be gratified by its use.

There are at present about forty creameries in this State. It is fair to presume that within five years there will be one hundred ; and within another decade, nearly the entire output of dairy products will come of associated dairying. This will not be so much an excess as a change of production, though the increased profitableness of the business by means of the change in manufacture will induce many to engage in it more than heretofore. The cry of "over production" is already in this as in the fruit business, but a larger production is going to make way for a greater consumption. Cold storage is already resorted to with profit, to hold back the surplus of the growing season, and in a measure even up the supply. But cold storage means that the butter shall remain intact.

No one really wants stale or re-packed goods of this kind. Butter cannot be re-worked and retain its desirable qualities. This characteristic of the trade will keep supply and demand in sight of each other.

There is no reasonable fear of competition in butter making until the production exceeds the home consumption. Butter is regarded as one of the luxuries of life. People *can* do without it if they will, but they wont if they can get it and they want the fresh made article. This is what makes the home product in constant demand if quality is only maintained. If it excels, as it may in these Northern states, it commands a fancy price according to the customer's fancied taste. "Fine, fresh Northern creamery," is a quotation that stands at the head of the market list, and if you are only ambitious to excel and keep your goods in that list, there is no danger but that you will find a sale for them if anybody does. With the rich pasturage of our green hill-sides, and the sweet hay that is gathered every season from well tilled fields, it will be a shame for the Maine dairymen to suffer by comparison.

A TALK WITH THE MAN WHO PRODUCES THE MILK.

By HON. W. D. HOARD, Wisconsin.

Mr. President, Ladies and Gentlemen:

My talk, before you to-day is somewhat fragmentary. It could very well be characterized under the term, "*pointers*."

I shall not attempt to present to you a close, compact resume of dairy thought, but take up some of the questions of dairy practice according to modern dairy standards.

Let me say in the beginning that I am in the business, practically; and what I have to say to you will be measured by the fact that my money is at stake; that my pocket is in the balance; and that good judgment must preside or I lose my *balance*.

Now in Wisconsin, as well as in Illinois, Minnesota and Iowa, the business practically constitutes a closely organized form of associated dairying. Dairy progress in its best sense is seen there; largely for the reason that we are at work under the associated or co-operative system; and every cheese factory and every creamery becomes a dairy school and every patron goes to school in the morning, as he used to at the old red schoolhouse; and he takes his education as a rule home with him.

Butter is made in that country quite largely on the separator system. The milk is brought to the factory the same as in the old cheese factory system. The gathered cream system is used mainly in very sparsedly settled sections where the cow population is not dense enough to make any other practicable. Now we have a great deal of agitation along these lines; dairy problems are springing up at our feet all the time. We have to take new ground; ground that I find is disputed when I come into the Eastern states. Conclusions that we have established and settled and are doing business on, I find in many places in the East, are questioned with a great deal of skepticism; so in what I say here, I do not want you to think I am challenging your or any one's opinion, but simply stating my own conclusions and you can weigh them up for what they are worth.

I was quite interested in the last essay; and there are two or three thoughts that I wish to bring out; for instance, this question of changes. While it is a very true statement that the speaker made that changes are coming with such rapidity that no man can hope for the success of old methods, still *principles* always remain the same. You change your school books, your arithmetics a great deal. I remember when I ciphered in old *Daboll* in 1845. *Daboll's* arithmetic is not used now but mathematics remain the same,—twice two are four to-day as it was then; so the principles and laws that govern dairy action are just the same, when once those principles are established.

Now these changes that are coming are due mostly to progress; advance of dairy thought along the lines of mechanical effort; chemistry and science have stepped in giving us new methods for determining old values. For instance, the Babcock test has done more to emancipate the labor of the dairy from hap-hazard guess work, than all the inventions that characterized the history of the world before that. It makes it possible for me to-day, to do things that were impossible years ago, to manufacture 2,500 pounds of butter a day with 260 patrons in four creameries and divide to each man every day "according to the deeds done in the body;" divide to every man according to the amount of butter fat he has furnished, each man receiving every day for the butter that he contributes to the general pool.

Now we are going to see other changes; we are going to see a just cheese making system coming upon the same basis that is commenced in Wisconsin and in Canada, and the apportionment of every man's due according to the Babcock test. Before five years, in all associated effort, we must prepare ourselves for these things.

We must not get behind old, exploded notions and think they will cover us; if we do, we will be left to shiver in the wind of our own adversity,—they will not furnish us protection.

We have many things to-day that we need to think about and think about sharply and earnestly, because the pocket nerve is affected; and I have noticed that men may talk about Christianity as much as they have a mind; nothing makes a man so anxious to serve his Maker as to make it *profitable*; and nothing so discourages a man in well doing, as to find it profitless.

Now this question of over-production was spoken of. Maybe I can give you a thought on that. My friends, we never have been able to make butter ahead of the cow, except the swindle known as oleomargerine. I repeat—we have never been able to make butter ahead of the cow. If every man in Maine resolved to go into the dairy business, it would not add one cow to the number that is in Maine; not *one.* If every man built unto himself a creamery, it would not add a cow. We cannot go any faster than the cow development. The increase of cows in Maine is slow, as in Wisconsin. Only five and a half per cent yearly is the increase in Wisconsin. Half the calves are *males*, they are of no account. Of the other half —the females, not more than five and a half per cent annually is added to the list of *mothers.*

Now we want to see if this dairy business is reliable and steadfast. You have not seen any farm product in the history of your life, that has shown such stability as the dairy product has; stability of price and of demand. We are not making to-day anywhere near or half enough of good butter to meet our own home consumption, and my friends, I want to see the day when good creamery butter can be made and put into the mouth of every man in this country for twenty cents a pound. I want it for two or three special reasons. I know when that time comes, a thousand men will eat butter where only one eats it to-day. In addition to that it will do more than anything else to stop the sale of fraudulent substitutes. Third, it will increase the stability of the business, by adding immensely to the consumption. I want one other thing; I want to make myself intelligent and educated in my business so I can make butter at twenty cents a pound and make just as good a profit as I do now at thirty. I must become intelligent enough to decrease the cost of production at my end of the line so I can produce twenty cent butter and make as much as I can now at thirty cents. This thing I am under bounden duty to do, for such is the tendency of all other manufacturing.

The great drawback to the Maine and Wisconsin farmer, is in thinking he is a producer of butter, grain and pork. He is not a producer of anything; he is a manufacturer. He has no business to call himself a producer. If he would once consider himself a manufacturer he would gain courage and profit by an increase of manufacturing intelligence and the study of fine economies.

He thinks now that God is responsible for his business; he thinks God stands behind him; and I guess He does; if He did not, I don't know what under the sun would become of him, half the time.

You cannot control prices; it is impossible. What folly and nonsense to waste breath until the cows come home about what we shall get for our product. That, we cannot control; but we have a part that we *can* control if we have *gumption* enough; for that is the end that lies with us. We can control the cost of production.

That will constitute a part of what I will have to say to you. Therefore we need not be so afraid of *over production* of *good* butter; but we should be mortally afraid of this everlasting over production of *poor* butter. That is what is making the trouble to-day.

One pound of poor butter hurts the sale of ten pounds of *good*. Poor butter as well as poor fat of any kind blocks the consumption of good. I wish to add here that the future form of associated dairying will be the combined cheese and butter factory, with cows coming fresh in September or October with the extractor in the factory. It is already being handled and carried on in this way in Wisconsin and the increased profits to the patrons have become a very marked factor.

My associate editor has a factory conducted on this system. He takes in, say, ten thousand pounds of milk a day and by the aid of the Babcock test, when that milk is in the vat, he takes the percentage of butter fat contained in that milk and knows just how much butter fat is in it

He wants to make thirty per cent standard cheese; cheese which must have thirty per cent of fat in it. He finds for instance, that that milk contains four and ten one-hundredths per cent butter fat. He draws out twenty-five per cent of the milk. We will suppose that he needs to have three and ten one-hundredths of fat in order to make thirty per cent cheese. He draws out twenty-five hundred pounds and runs it through the extractor and takes out a hundred pounds of butter, and runs the sweet buttermilk and sweet skimmilk directly back into the vat and makes up the whole mass into cheese with thirty per cent of fat, and sells that cheese on the market within three-eighths of a cent per pound of the price paid for the best fall, cream cheese and has the butter left, worth twenty-eight or thirty dollars. You will see how these finer economies of thought and practice are coming to the front. Farmers must post themselves on such questions or they will be left behind. I submit it to you to think of. We need not worry at all about the creamery or the cheese factory; the creamery and cheese factory will take care of themselves. We need to direct ourselves to the instruction of the individual farmer, so that he can make his end of the evener a profitable one Now to the man who makes milk, if he has kept pace along the way, everything else will take shape at once.

When I talk with dairy farmers in New York, Vermont and Maine and to a certain extent New Hampshire, I find among them serious discouragements. I find men constantly saying that the dairy does not pay; talking all the time about the competition of the West. Gentlemen, there never was a more serious humbug on earth than this talk about the competition of the West. A pound of butter made in Maine will compete against a Maine pound of butter just as much as if it was made in Wisconsin. We compete with each other in the West as you do here. If you enlarge the product of Maine you compete against yourselves, as much as if the product came from Wisconsin.

It is time that that nonsense was closed out. We can look at this question from one standpoint; our own individual relation to it. We have men in Wisconsin making the same complaint, that dairying does not pay there. They stand around full of lamentation, saying it doesn't pay. They are regular Jeremiahs. If you suggest that the difficulty lies in them, they repudiate the insinuation at once. That sort of men are always full of lamentation. We have plenty of them in the West. Let us not take these men as examples of what can be done.

That question of competition of one section of the country with another is not sensible. We stand or fall as one family.

To-day, Wisconsin does not compete with Maine any more than Maine with herself.

What is the matter? I can tell you what I think is the matter. We have been running along, forgetting the changes in the condition of things; farmers are farming from old fashioned notions; handling their cows with very old fashioned ideas. I have heard this talk in the East about abandoned farms. Is Wisconsin to blame for that? Has Western competition impoverished your lands so the owners have abandoned them? But what did it?

Bad farming. What is it that has caused this destruction of the fertility of the land? What is causing it to-day in Wisconsin? Not competition with the East; rather bad farming.

Men are farming without intelligence concerning the laws that God has set over them. We must study more. We are trying to do $1,000 worth of business with fifteen cents worth of brains. It cannot be done; it never has been, never will be.

We must study to control the fertility of the soil; save up fertility. What have we been doing for that? What I have said will apply here. New Jersey spends $3,000,000 a year in buying commercial fertilizers. Maine spends a great deal of money in the same way; yet, my friends, I will go through Maine and see dairymen throwing away fertilizers by the wholesale.

How are you handling your manure? That is a pertinent question. An old man said to me in Vermont that the four great constituents in manure were nitrogen, phosphoric acid, potash and stupidity.

I want to take up nitrogen just a moment. What is this nitrogen? One of the principal components of the air. Free nitrogen; absolutely insoluble for plant life. It will not assimilate with plant life and when you want to buy it, you go to New York and pay nineteen cents a pound at wholesale for ammoniacal salts. You will pay nineteen cents a pound for it by the carload; and yet, nine out of ten farmers are throwing it away with the utmost prodigality. There is not one stable in a thousand so constructed, or the cows so handled to save the ammonia contained in the urine.

I want to give you a little bit of practice which is useful in two ways. First, to preserve the health of the cows. Ammonia will take the paint off your buggies; it will rot your harnesses; it will make your horses blind.

Thousands of horses are blinded by ammonia. Step into any livery stable in summer and you will note a strong smell of ammonia. It is just as unhealthy for cattle. You must keep your cow barns warm and how will you do it and still keep the air pure? This is a serious problem. How will you save this ammonia for fertilizing purposes which is thrown off by the cattle and horses? There is a simple way and it will not cost you much if a man has energy and sense enough to put it in practice. It is nothing but the sprinkling of common sulphate of lime or land plaster in the stalls and gutters. Step into the stable; if a male horse, shake up the bedding and there is not a farmer here but has had his eyes smart and his nose tingle with the exhalation of ammonia. That is worth nineteen cents a pound at wholesale.

Who cares for it? I can show you thousands who buy it; but who saves it? Go along by the stables of nine out of ten dairymen and see the manure thrown out at the side of the barn, the valuable elements to leach away in the rain, evaporate away, to waste in every way. The great practical problem is to know what to do with the things we have: how to make a better, wiser use of the means we possess.

We will have to spend some money. What is economy? My wife gave me the definition of that word. I complained about her asking me for money—a man would be sick if he didn't complain—I said it wasn't economy. She said "what *is* economy? It is wise spending for the things you need. It is not going without; that is not economy, it is privation." Wise economy consists in *spending* wisely.

We need to spend a little money here and save a great deal more. Take a barrel of land plaster that costs one dollar and sixty cents in Wisconsin; I can make it serve for six animals for two hundred days.

Sprinkle this land plaster as I suggested and you accomplish two results; you take this valuable, irritating gas out of the air that your cattle are to breathe and save the fertilizer. Step into the stable and take a handful of plaster and sprinkle in the bedding and the odor is gone. Every man who tries sprinkling land plaster two or three times a week in his manure heaps will find that it does more good there than anywhere else. It saves loss from fermentation.

It ought to be practiced by every man who knows how to spend wisely. I have used it for years; I first commenced to use it for the health of my animals. I noted at once the improved character of the manure, and I commenced to experiment to see in what proportion it was valuable. I took two pieces of ground and gave one a dressing with sixteen loads of plastered manure; the other I gave sixteen loads of unplastered manure.

On the first I produced four tons one hundred and twenty pounds of cured corn fodder of the Southern variety, cut in August and weighed in November.

On the other I produced about three thousand pounds.

I saw at once the wonderful value of this agent in saving that which had heretofore gone to waste. Every farmer should add to the fertility of his land by saving the nitrogen that his animals throw off. That is so much saved.

Now on this question, addressed to the man who makes the milk, comes up the question, not only of the management of his farm for special dairy purposes, not only the management of the foods, but as well the right handling of his cows. Right here my friends, if you are dairying wisely, you are dealing with one of the most profound mysteries on earth—this mysterious mother. Here everything is based upon the function of motherhood, and when I see men dealing with these matters with no knowledge and no care, I get discouraged. Then I grow angry and that relieves me. I get discouraged when I see the indifference of men to their own salvation; I guess every missionary on earth does the same thing. I often wish that the dairy business of the United States were in the hands of women for ten years. I have a record of forty women who are managing dairy farms; and there is not a failure among them, not *one*.

A Hollander, in writing about the cattle of his country, says: "The women of Holland handle the cattle of Holland." It is one mother handled by another mother. Hence the cattle of Holland, cared for by women are a wonderful success. If we could only project into stupid masculinity a little of the discernments of femininity, it would help along these lines. We need to be sharpened, made intelligent with regard to the delicate operations we are dealing with; we need to handle dairy cattle from dairy standpoints; with dairy intelligence, dairy judgment.

The other day I was in New Jersey. Those farmers were making milk for the New York market. I was *amazed*, cotton seed meal costing $30 a ton; linseed meal $27; corn meal $26; bran, $23; hay $12 to $15.

My face was at the car window watching every dairy herd I passed by; and I should say that as much as seventy-five per cent of the herds—and it was a stormy, bad day—were out of doors, from nine in the morning to four in the afternoon. These men were buying high priced food, trying to warm all out doors in that way, making milk for money.

There is the *mother*; that mother manufactures milk; she makes it according to certain laws. If those laws are obeyed, if the man who handles her understands what those laws are and conduces to her comfort and warmth, she answers to his profit at once; but if the man undertakes to force her into channels unsuited to the law of her being she says *no*, then she refuses and only gives a modicum of the results she might. Those men were after milk for profit, yet they did not understand that a cow cannot create milk *profitably* out in the cold storm. I wish you could look over my creamery weather book.

An old German, who is a patron of mine, came into the creamery one day. I says, 'Fritz, your cows were out yesterday in that cold rain.' "Yes, them cows, they were out; how you know, you go by there?" 'No.' "How you know?" 'Here is your milk, the milk they produced yesterday, brought in here this morning. Here is a loss of a hundred and ten pounds from the day before. Do you see what did it?'

"Oh, the cows they run out and it rain on the cows" 'Well, Fritz, they were out in the cold rain and it shrunk the milk and besides it isn't worth as much; it has taken the fat out of the milk. You ought to have been smart enough not to have lost that $1.50 worth of milk.' "Well, I cannot run after them cows, they must take care of themselves." 'Then you ought to take care of yourself. Wouldn't $1.50 have paid you to go and bring the cows out of the storm? Couldn't you afford that?' "Sure, I could do it for 30 cents." 'Why *did'nt* you do it?' "Well, I know me nothing about that."

'Now you know it, you will see to it hereafter. I don't want to see you lose $1.50 because you don't believe the truth.'

By and by when I get that $1.50 idea into Fritz' head, I would rather have Fritz than a dozen Yankees who acknowledge the truth but never do it; who say, "I go," but never go. I don't want those fellows to work in my vineyard.

I said I wished you could see my creamery weather book. It is an attempt to get at the clear idea of the effect of the weather upon the production of the milk of, say one thousand cows.

In the fall of the year when men are rarely housing their cows, you will find the farmers losing money in that way, by not taking proper care of and housing the cows.

I told you last winter in making comparison, that the cow is a good deal as Voltaire says about making love to certain women. "If you would have certain women love you, you must fill them up with love for *themselves* and what runs over belongs to you."

That is just exactly true of that bovine mother. First, you must provide her with what she needs, not forcing her to provide her own needs. For instance, if you have turned a cow out in the cold, she will take the butter fat out of the milk to warm herself with. You ought to know it, I ought to know it if we are wise, understand that she will take that out to warm her body, and not your pocket.

The first principle in milk giving is *warmth*. In understanding the laws of motherhood, my wife taught me more than all the books I ever read and I ransacked everything while I was studying this question for thirty years. She was a mother I could question concerning the functions of motherhood in the interest of this mother that I could not question.

The laws that govern the human mother and bovine mother are exactly alike from beginning to the end. I wish dairymen would consult their own wives, who are mothers, a great deal more than they do on these things.

My wife was delicate and our youngest boy, a lusty fellow nine months old called on her for more than she had to give. She was riding with me one day, she took a sudden chill. She said, "I am so sorry I received this chill."

"Why are you sorry?" "Because it means less for the baby."

I asked, "Why does it mean less for the baby?" She replied, "You ought to know." Oh, these men who *ought* to know a great deal, but don't know half as much as they think they do. Then I asked, "Does this chill shrink this milk-giving function with you?" "Certainly; always" "What will you do to restore it?" She answered, "I will first get warm; then I will take warm drinks; I must restore this function for the sake of my baby." That was right splendid sense, simple sense, God blessed sense; I wish it was more a fashionable sense.

It flashed across my mind—this was twenty-five years ago—that this must be the same law with the bovine mother. I went to making experiments with warm water and reasoning out this law of warmth as applied to the functions of motherhood. I made experiments with my cattle; I observed and marked facts; then I published to the world what I thought was my discovery. I thought I had found out a great thing; but I soon learned that every mother in the land knew all about it and had years before I was born.

Why hadn't these mothers taught their sons when young concerning the law of motherhood so they would not handle the cow as though she were an ox?

I have always supposed the average American was sharp and smart to see the penny of profit; but in this business, it looks as if nine out of ten men do not see it.

The cow must have warmth. I want to bring out a few points about feeding. We must learn to feed dairy cattle, if producing milk in winter, *according to the laws* that govern lactation.

Why do you buy so much bran; so much cotton seed meal; why so much linseed? You are paying thousands of dollars for these foods here in the East and so are we.

A cow producing a pound of butter, also produces nearly a corresponding amount of caseine. There is such a thing as protein in food. Every man has read of albuminoids or protein and carbo hydrates. We must feed the cow a certain amount of protein elements in her food or she goes down.

You are feeding for butter. When she gives you one pound of butter, she gives a pound of caseine; caseine is almost pure protein; the element that builds up the muscles of her calf. She must yield a certain amount of caseine and you must support her in the production of her milk in all its elements or she will not give you butter fat. You furnish a cow a certain amount of nerve and muscle support, because the nervous system is called upon wonderfully in the production of milk. You buy cotton seed and bran, both containing a large amount of protein. You are wise in doing it, unless you can be wiser.

What I want to get at is this: You Maine farmers must produce this protein food. I have been agitating this question, and preaching this "one thing," as Paul says. I have preached this constantly all the time; I want the farmer to save his money; keep it at home. I cut out from my paper this morning, a part of an article I wrote a few weeks since on this question of buying food. Here it is. "A few years ago when the drought cut off the hay crop here in Wisconsin, we saw hundreds of farmers buying poor prairie hay from Iowa at $9 a ton, when good bran was worth $12 to $14 a ton. A few shrewd, thinking farmers (they had studied Stewart's Feeding Animals) could not be fooled that way; they bought the bran. They had taken their pencils and, with an understanding of the value of each food to start with, they soon found that one ton of bran had more feeding value in it for a cow, horse or sheep than three tons of that over-ripe miserable hay." We remember distinctly how we tried that year to get some of those hay buying farmers to spend two dollars in the purchase of "Stewart's Feeding Animals," so that each one might have a book in his own house that would help him to get an understanding of the relative value of different kinds of feed. But no one could fool them into buying a book! One man said to us, "What does a book know about feeding a cow?" He threw away over fifty dollars in Iowa horse bedding. He belonged to that class that thinks it is smart and *economical* to use as little brains as possible in all farm operations. In Hoard's Dairyman of December 11, on page 1858, we published a short extract from the Rural New Yorker, under the head, "The Reason of the Thing," which clearly illustrates the proportion of value in different kinds of feed, by which we can determine whether it is cheapest to buy this, that, or the other kind of food for milch cows. The one thing we are after in all these boughten foods is the protein. That is the element that makes them worth buying. The cows need it. If we do not grow peas or flax seed, we must buy protein in some other form. We need to have a clear outline idea of the economic relations of these protein foods, so that we can determine for ourselves which to use.

Here as everywhere, principles govern. If we are trying to practice without a knowledge of principles, our practice will be as blind as we are.

What would you say of a lawyer who studied only the practice of the courts and knew nothing of the principles of the law which must govern the courts? Yet he would be exactly like certain farmers who make no study of the principles of the very agriculture they are trying to practice. But here is the "reason of the thing." "In order to obtain protein enough to enable her to do her duty, a large milch cow would be forced to eat about eighty pounds of good timothy hay per day or nearly 160 pounds of corn fodder, or 150 pounds of ensilage, or nearly 400 pounds of oat straw. She could obtain the needed quantity in twelve pounds of pea meal, nine pounds of linseed meal, seven pounds of cotton-seed meal, or twenty pounds of wheat bran. Timothy hay costs us this winter just one cent per pound while linseed meal is worth 1½ cents per pound. The timothy ration would cost eighty cents, while the linseed meal would cost 13½ cents. A cow's time is worth nothing, but still she cannot afford to spend the hours required to chew and digest eighty pounds of timothy hay. Neither can she live on the linseed meal ration without something to add bulk to the food and thus keep her digestive organs in condition." In "combination" there is strength and profit. Forty-five pounds of clover hay will supply more digestible protein than eighty pounds of timothy. We know dairymen near the large cities who can sell timothy hay at one cent a pound, and buy good clover at three-fourths of a cent. Under such circumstances when they feed their timothy they feed it at a loss of more than one-half of a cent for every pound they handle, which is a mighty big price to pay for the fun of "doing as father did." There is something very instructive in those figures. A man is figuring, for instance, which form of proteim he will buy. Shall it be bran at $20 or linseed meal at $30 a ton. According to the *Rural's* calculation, and it is correct, it costs twenty cents to get the same amount of protein in bran that would cost 13½ cents in linseed meal. But suppose it is poor, adulterated bran we are buying, what then? But suppose we have shown cow sense enough to not buy either, but have grown on our own land about a thousand pounds of nice peas for each cow. If well handled in a fair season, two thousand pounds of peas should be grown on an acre of land. Take the same proportion of value that the *Rural* gives pea meal, which is nearly twice as valuable for butter food as the bran, it would simply amount to helping the farmer to grow, say, forty dollars worth of protein food in the form of peas on one acre, that he would have to pay that amount of money for if he brought bran.

We want to see the dairy farmers keep all of their money in their pockets that they possibly can, and it will pay big profits to look into this question. Begin to lay plans to grow your own protein food. But the first thing of all for these long winter evenings, send two dollars to the Dairyman for "Stewart's Feeding Animals."

Post up a little more on the relative value of foods. As the Hoosier said, "There is a heap to learn that'll pay to know."

I have been trying to get the dairy farmers into growing peas and stop this paying big prices for bran, linseed and cotton seed meal. Two thousand pounds of peas should be grown on an acre of land. Peas are nearly twice as valuable as bran as a butter food. What is the difficulty with growing peas? In almost every instance it is a lack of understanding concerning the culture of the plant.

Old notions; the boy said it run in their family to be college educated; he had two uncles who went to college. There are men to-day who think you must inherit knowledge in farming; daddy sowed peas and harrowed them in and grandfather the same way. The pea is a deep rooting plant; it is rarely successful unless planted deeply.

Take a piece of early land, not too rich; fall plow it and get on in the spring, harrow thoroughly just as early as you can and sow the peas. Early frosts do not affect them.

If you sow Canada peas, sow two and a half bushels to the acre; for the marrow-fat, sow three bushels; sow thickly. and cross plow; plow them in four inches deep; then on the back of that, sow a bushel of oats per acre and harrow them in. Your peas will be about eight days coming up but they will remain and fruit bountifully; the heat of the summer or drought will not affect them.

I want you to see where this means *money* to you. I am reckoning bran at $15 a ton. What is it worth here?

Answer. Twenty-two dollars a ton.

That is still more binding; but my reckoning is at $15 a ton. At Fort Atkinson, Wis., twenty-five bushels of peas to the acre is a moderate crop, equal to 1,500 pounds of pea meal.

By every experiment that I have been able to make, two pounds of pea meal is equal in butter making value to six pounds of bran. At that valuation, 1,500 pounds of pea meal would equal 4,500 pounds of bran. At $15 a ton, $33.75.

Would it not pay any farmer, if he could produce that amount of food? Peas are grown easily and readily in the way I have described. Peas, a valuable dairy food and every farmer in Maine can produce them. Why should he pay those Mississippians such prices for food when he can raise it on his farm?

I want to talk a moment concerning the stabling of cattle. I want to see Maine men come to the same understanding that we have in Wisconsin on the question of winter dairying. You must make milk when it is worth the *most*, not the *least*. Then your help is cheaper in winter than in summer. If you have a dairy of twenty or thirty cows, you can secure help by the year and you are making as much money out of help in winter as any time of year. When cows are dry in July or August it is a relief, for milk is clear down in price and you are not producing much. When it is clear up to the highest you are producing the most. If a cow comes fresh in April, on giving milk six months, she strikes cold weather and dry feed and commences to shrink in yield. Let her come fresh in the fall and at the end of six months she strikes fresh feed in spring and that enlarges the yield. Cows fresh in the fall will give from 1,500 to 1,600 pounds more than if they calved in the spring.

That is a simple operation that ought to appeal to any man if he wants to make the largest profit possible in this business.

I want to see a reform with regard to stabling cows. I want to see men letting in three or four times more light into stables than they are to-day. Plenty of light has a grand effect upon a milch cow.

Shut up a Gurnsey cow that gives high colored butter, in a dark stable continuously for two weeks and it will bleach the color of that butter very perceptibly. Sunlight has much to do with the color in your butter. We need, also more sunlight to add to the health of the cows. Positively if you will put double the windows in the stable, it will take less hay and food than if kept in the dark. A large portion of cow stables are down under ground to-day; dark, dank and noisome.

I want to see the day when the barbarous stanchion shall go out. It was never invented for the cow's comfort, but for man's comfort alone. John Gould said the other day, that Thomas Gould was put in the stocks in Boston in the old Colonial days for giving aid and comfort to Quakers, and ever since then, the Gould's had been opposed to all stanchions. They found out how it was themselves.

I am opposed to the stanchion because of the danger of it. The deep drop is almost an invariable accompaniment. I have seen many cases of abortion on account of the drop behind the cows. I have been looking for years for a humane, intelligent way to tether my cattle, and I found it only a few years ago.

I intended to have had a diagram when I came, but found it impossible to get it in time. I want to show you the way to tether a cow, that is cleanly and humane and appeals to your own sense of goodness. I can describe it partially.

(The speaker illustrated from a diagram he made on a sheet of paper.)

Let us suppose here is a whole row of cows tethered with their heads together. Standing in front of each cow is a board partition rising four feet high. The floor is water tight, with no drop, except behind the cow is just a jog of two inch plank, one thickness. The cow stands on the stable planking which is only one plank higher than it is at the rear of her. To this partition, two feet from the floor a two by eight scantling is nailed to form the bottom of a feeding rack like an old fashioned rack for feeding horses.

The bottom of the two by eight constitutes the bottom of the rack with slats nailed on two and a half or three inches apart, *standing toward the cow*. Each cow is given three and a half feet space in the width of her stall. The top of the rack is about four and a half feet high. A two by four runs along the top and the top end of the slats are nailed to it. The purpose of that rack is to throw in the coarse fodder; but the main purpose is to force the cow back when she is standing. Every cow is fitted according to her length. Cows vary eighteen inches in length. The cow is brought up even with the rack and just forward of her hind feet as she stands on the stable floor, spike a three by four right on to the floor just forward of her hind feet. That is a bar right across her stall. The space inside of that three by four is filled with bedding and the bedding will last two months, or until it is ground to powder. It should be replenished once in two or three weeks. I buy a thirty cent halter and put it upon the cow. There is a ring screwed into the centre of the two by eight at the bottom of the rack, to tie the rope in, then bring the rope out and split it at the end and braid it out in two strands and put a snap on each one. I snap both these ends in the ring, then if one gets loose the other holds. The cow stands there, for the first two or three times she will lie down across the bar in the stable and get up. She will figure on that once or twice then step inside and lie down on the dry bedding.

I have Gurnsey cows, partly white that I have kept in this manner and you could see no more dirt than when in a June pasture. I set up two 2 x 4's as a partition. I don't want one cow striking against another. One of the most prolific sources of stoppage in the teats is due to the stanchion system. Cows lie down and other cows step over upon their teats. I have known hundreds of instances where I was satisfied that stoppage of the teats is due to that alone; but men generally declare that it was due to *garget.*

I save all that risk; my cows lie down and are contented and clean. I use land plaster to keep the stable sweet and the cow healthy and I am very much happier than I was when I saw her in the stanchion. There is an ensilage and feed box along side of the stall. Cows usually lie regularly on one side or the other. If she lies on the left side, the grain box is put on the right side and so vice versa.

These are some of the conclusions of the best thought I could find, that I have been giving you to-day along these dairy lines. I want to say that I am not bringing this to you, thinking that Maine is not just as well posted as Wisconsin; I come to Maine and find many things to learn. We need a great deal more of interchange of thought than we are getting, and above all things, let me say to you as farmers, that the man who would make money out of cows, must handle that animal as a dairy cow, feed as a dairy cow, and learn to reduce the cost of production of the milk. To that end, we need the silo. I am astonished to find so few educated to the silo here in Maine. There are forty-five in town where I live; in the town adjoining, sixty-five silos. You need to produce food cheaper than you do. We are after the last cent and we find we cannot produce the milk cheaply without the aid of the silo.

Ques. I would like to have the Governor explain about the partition between the cows?

Ans. The partition is one or two 2x4's set back about to the hip of the cow. If one cow lies down, she is inside and her head comes under this 2x8, the bottom of the rack. Sometimes if cows hook one another you will have to nail a board up between them. These two vertical scantlings stand there as a partition and the cow cannot swing over upon her neighbor. These are set up and fastened to cross scantlings running lengthwise over the cows.

Ques. How do you get the provinder into the feed box?

Ans. Right in front of her is an opening in the partition. In one corner, out nearly flush with the rack, you fasten a long feed box and raise the end at the opening a little, so the feed will work down toward the cow.

Ques. You have an opening in front of the rack where you feed?

Ans You can have it open or shut as you like.

Let me say to you, my friends, that by *ventilation* we mean change of air; you cannot get ventilation without change. If you get that change, you get cold air. You cannot secure that and keep the warmth of the stable; you must ventilate by artificial means. You must purify the air of the stable; keep the air coming in moderately. By absorbents you can purify the air and destroy the effects that may come from bad air and foul gases. I would use land plaster with the residue of every animal and when it was thrown into heaps I would scatter it over the heap every two or three days.

Straw is a good bedding, but under my system of tying you do not need to be to any expense Ordinary straw, or leaves gathered in the fall are good;—I gather and store them for the winter bedding of my cows. I put in leaves and a little straw with it. It is interesting to note the great economy of bedding in this form of tying.

Ques. Don't it tread out under the cow's feet?

Ans. If it does you can readily shake it up. This will not do with the stanchion system. The cow must have a chance to step back when she stands up and come forward when she lies down. The stanchion does not give her that liberty. The bedding packs down somewhat, but you can make it light; you are there to handle it, and not the cow. There should be a very little incline away from the cow for drainage, so the moisture shall not run under her.

Ques. What about the construction of the silo?

Ans. They are made of wood. They are constructed, as a rule, about twenty feet deep; can be put in bays of barns; constructed entirely of wood. Some are agitating the question of one lining; others think best to have two thicknesses. The boarding should be horizontal; if it is vertical, up and down, the cracks will let air into your ensilage.

Ques. Is there a partition between that boarding to keep it from freezing outside?

Ans. You set 2 by 10 or 12 scantling on sills, set them up sixteen inches apart. Then on the outside you board with ordinary boarding and clapboard or batten. That is the outside of the silo or barn; but *inside* you use matched stuff. Put on building paper over that, then board again. You have an air space of ten inches. Your ensilage keeps at about seventy or eighty degrees. It cannot freeze unless it is against stone. With some who have built a stone silo, when it was twenty degrees below zero, it sometimes would freeze into the silo a foot or such a matter; but against wood it never freezes.

Ques. About the peas; do you get a pea that ripens at the same time the oats do?

Ans. I would sow oats for the purpose of holding up the pea. I get some grain, but I am not so concerned about that; I would cut the pea early; cut before it is ripe, when the pod is green enough—after it passes the cooking stage, too hard to cook—the pod is green and shrinks down and holds the pea. If I carry it too far, it opens and sheds the pea.

We thresh by machinery; the threshing machine is common in Wisconsin. I saw a man in Connecticut, who told me he never saw a threshing machine.

If you sow barley thickly it will fall; but with oats, they stand up quite well. Sow thickly and if they fall, they fall one way and it is not difficult to mow them.

When they are mown, dry them out sufficiently and stack them, or load them on a wagon and carry to your barn and when the thresher comes to thresh out the grain, the pea stacks stand with the oat and wheat stacks. It would be better if we housed all our grain in barns.

Ques. How soon after they are cut do you stack them?

Ans. Just as soon as you think the straw is dry enough to stack; that is, use individual judgment as with any other grain. Of the Canada pea I sow two and a half bushels to the acre; of marrow fat, three bushels to the acre.

Ques. How long would you have a cow go dry?

Ans. Not over sixty days. My cows come in in September and are bred in January to come in again in September.

Ques. What is the consequence of milking the year around?

Ans. I have seen cows determined that way. It is a hard matter to dry off, certain Jersey cows particularly. With the ordinary scrub cow, you are not bothered much in that particular.

Ques. What would be your preference: to have them go dry a while or milk up to calving?

Ans. Well, my idea is, that I can do away with pretty much all the bad results that many claim that they know of, by certain handling and feeding of the milch cow, clear up to the time of calving; but I like to give the cow thirty or sixty days rest. I cannot say that I know it is for the best; I have a notion that way. Some men insist upon giving a cow six months. The question is with me, I must make dairying profitable; I must make the cow earn the most money possible. If there is anything which some men say is not just natural, I must make it natural. The modern cow is an artificial production anyway; if you want a *natural* cow, you will find one in Texas. I had three hundred of them chase me over two miles. They were not burdened with large udders but I was mounted on a good horse. I think if a man is to be judged by the enthusiasm of his following, I was as popular a man as ever was seen in Texas.

There is the cow Matilda (pointing to diagram) that gave her weight in butter in one year. I made a personal study of that cow. She is not a natural cow; I mean by that, what lots of men call a natural cow. When you get down to their ideas of what is *natural*, you find it is a kind of naturalness that you cannot make any profit out of. That cow has a constitution to do her work if you will provide surroundings for her. Some want a hardy cow. Over in Connecticut, I said to a friend, "I don't like the way you handle your cows, with the hair all standing out." He replied, "That makes them *warmer*; it is a sign of a healthy cow when the hair stands up like that." I said "I am glad I am not your cow." Now, he had a notion that I could not agree with. He talked to me about cows being hardy; he had good Jersey cows that I would agree to take and in one year's time, make them produce 350 or 375 pounds of butter a year. He was doing first-rate, he thought, with 200 pounds. That man wanted his cows hardy. I do not want a hardy cow as men generally understand hardiness. I want a cow that has a constitution to do dairy work; but if I want the best profit I must try to build up a constitution to stand exposure and neglect and still expect profitable dairy work. The constitution in the true dairy cow is different from that of a "rustler," a Texas cow, for instance. Some men think a cow must be a *mother*. The constitution she has to sustain the strain of milk giving. I must give her right surroundings. She cannot stand the strain of profitable milk giving and at the same time, the strain of exposure and neglect.

Ques. How do you pick out a good cow?

Ans. How to pick out a good butter cow. Any man is bound to make a good many mistakes, but good judgment may be very profitably exercised in selecting a good butter cow. As a rule, the shape of the udder, the character and feel of the skin is different in a rich butter cow than in one of a moderate capacity. Almost every cow that gives five or six per cent of fat in her milk, has an udder that is inclined to be fleshy; that when you have done milking, still retains its shape, while with the cow that gives thin milk, it is shrunken like a glove. The cow that gives rich milk as a rule, has a more fleshy udder. The cow that gives very rich milk has a more complicate cellular construction of the udder in order to accomplish this deposit of fatty matter. She cannot have this increased cellular construction of the udder, without showing it in the appearance of the udder. That is one of the evidences. There are others along the same line. You cannot tell a man in words what you know by experience.

Ques. Does the color of the hide have any bearing upon the amount of cream or butter fat?

Ans. No. It is simply an indication of whether a cow makes yellow milk. That is all I could ever find out about it. The *feel* of the hide is an indication, but I cannot describe it adequately in words. It must be learned by practice.

Ques. How is it about the backbone?

Ans. That is one of the most important items in the judgment of a cow. I pay more attention every year to the study of the backbone; and value a right appearance higher, provided I find the other machinery to correspond. Of course a good cow must have a good udder. Occasionally you may find a cow with a well shaped udder that is a perfect failure.

After having found a cow with well developed machinery all around; then comes the question, whether she has endurance in the exercise of that machinery. That must be determined by experience. One of the evidences of a strong constitution is the umbilical development; the navel. That is the best indication that I have known.

A strong, rugged backbone indicates that the cow furnishes or feeds the mammary organs with a large amount of nervous force.

If so, you may know that she is persistent, because the production of milk draws heavily upon the nervous machinery that is supported by the brain and spinal marrow, and a large spinal process indicates large spinal marrow; and a large spinal marrow indicates a large degree of nervous force.

The maternal organs derive nervous support from the spinal marrow and the brain. The work of maternity is a draft all the time upon the nervous system;—the brain and spinal marrow. Hence the value of this indication of the back bone.

We hear considerable about a cow needing exercise when giving milk in winter. Turn a good cow in a summer day into good, rank feed and she will fill her belly quickly. What then? Does she roam around for exercise? At once, the cow lies down if she is giving a large quantity of milk. If dry, the cow has nothing in the world to do in that particular and she has her head up and is examining your fence to see how it is made; but if giving a large quantity of milk; if she is being drawn upon largely through these channels, the moment she fills herself, down she lies. If you have given her short feed, then she has to exercise to get it; but that you ought not to do. She is expending her powers in exercise rather than milk; that is not profitable. No cow that is in the full possession of her maternal functions will seek exercise; and the man who forces her to take exercise, in my opinion, does not understand the cow. She is drawing upon her nervous system very much, to make a pound of caseine, 1 7-10 pounds of milk sugar. She is drawing upon her nervous system more to do that, than a span of horses would to plow all day.

That word, *exercise*, don't mean that you should not put the cow into the barn and give her the most comfortable surroundings; if to shut her up you must stand her in a narrow, daık, stall,—if you must choose between stanchioning a cow or letting her be out of doors, let her be out. But if you can devise some good system don't worry about exercise; but *do* worry about the healthfulness of the surroundings.

Ques. How about watering? Do you turn them out? About warming water?

Ans. Warm water is most profitable when you do not have a comfortable stable. Before I would turn a cow out to drink ice cold water, I would carry it to her in a pail. You must take it out of yourself or the cow, and it is more profitable to take it out of *yourself.*

If I had to turn my cows out I would devise some system of warming their water. Five cents worth of soft coal a day will warm water for sixty cows.

Ques. Would you rather a cow should be watered twice or once a day?

Ans. I would rather they would have it twice. If you watch a cow, you will see her drink seven, eight or ten times a day, if she has water handy; in such cases they will drink not more than a dozen swallows at a time.

Ques. They don't in summer?

Ans. Because they don't have the water at hand. If you want to see if a cow will do that, put her in a pasture close to running water and see how often she will go and drink. In the copy of Hoard's Dairyman here, you will find several devices for warming water. One of them is a tub, and running through that tub is a cast iron pipe with a little bit of a furnace on one end. This pipe runs through the tub of water, and five cents worth of coal will warm that water up to sixty or seventy degrees, and enough of it for sixty cows. If I could water my cows in their stable where they are warm in place of warming the water, I would do it.

If a cow is fresh in milk in winter and you want to get the largest amount of milk, it is profitable to warm the water, because she is very sensitive to cold. She will not drink water enough unless it is warmed to suit her. There is that little shade of difference to be thought of in the pro and con of this question.

Ques. When is the best time to feed grain; before or after watering?

Ans. As a rule, I think it is best to feed grain alone, *after* watering; but I don't know as there is any particular advantage one way or the other. I think the best system of salting is with rock salt, placed where the cow can get it as she likes. But a man cannot always do just as he theorizes; but I would have cows have salt three times a week at least. If I had conveniences I would feed my grain with the hay; I would cut the hay. If I had ensilage, I would feed grain with the ensilage. I don't know as there is any particular difference in the digestive effect of it one way over another. If it is ground feed it is not raised in rumination, unless it is fed with hay, but there is some dispute about that.

Ques. Does it make any difference whether the water is given before or after feeding grain?

Ans. I think it would be a little safer to give the grain *after* drinking. It is not clear in my mind that any bad effects would follow any way. If a cow is strangely off her drink as well as her feed, she will refuse water for a day. Turn her out and she will drink a little and go away. Then perhaps she will drink excessively after she has been fed her grain. I do not think it has as healthful an effect as if she had first drank her water.

Ques. What do you consider a good ration if you don't have pea meal?

Ans. I spoke of pea meal, cotton seed or bran, from the standpoint of a protein food. My favorite ration is a little higher ratio than one to five. One pound of protein to seven of carbo-hydrates. You can figure that easily. Take cotton seed meal; if you have an analysis of it, you know it has such a percentage of protein; you know that oats and all these have a certain percentage. You can figure the protein up so you have a percentage of about one of protein to seven of carbo-hydrates.

If you have good butter cows, you may want to bring it down to *one* to *six*, or one to five.

Take this kind of a ration, one hundred pounds cotton seed meal, three hundred pounds corn meal and a hundred and fifty or two hundred pounds of bran. Mix them all up together and give a cow about seven pounds a day. I have noticed that as a rule, cows rarely digest over seven pounds of such a ration a day. I cannot get the results out of big feeding that men talk about, for I waste feed.

We should weigh feed all the time. I have taken a microscope and found my linseed meal and bran in the excrement.

Thousand pound cows will digest about seven pounds of such a mixture a day. Beyond that, I think it is doubtful.

THE BABCOCK MILK TEST.

PROF. WALTER BALENTINE.

Ladies and Gentlemen: The subject of the Babcock Milk Test was to have been taken up by a gentleman who is absent to-day, and I am requested to do the work in his place.

By the Babcock method, the particular instrument which measures the percentage of fat which any sample of milk contains, is a small flask with a graduated neck. Into this flask is brought 17.6 cubic centimeters of milk, to which is added 17.5 cubic centimeters of sulphuric acid, having a specific gravity of 1.82. The acid first coagulates and then dissolves the caseine, destroys the milk sugar and sets the fat free. After the sulphuric acid and milk have been thoroughly mixed, the bottle is put into one of the pockets attached to the rim of the metallic desk in this machine. The pockets are attached to the rim of the disk in such a way that they are left free to swing outward when the disk is revolved. Below the drum of the machine is a wheel with a crank. This wheel is geared to the disk above and when the crank is turned, the disk is made to revolve rapidly and the pockets with the bottle containing the samples of milk to be tested to assume a horizontal position with their necks pointing toward the center of the disk. Owing to the difference in the specific gravity between the fat and the liquid in which it floats, the centrifugal force generated by the revolving disk, throws the mixture of milk, serum and sulphuric acid to the outer end or bottom of the bottle; while the fat takes up a position at the top or inside. After keeping up the motion of the machine for five minutes, the machine is stopped and the bottles taken out and filled with hot water until the fat rises in the necks of the flasks above the zero mark and then returned to the pockets in the machine. The machine is again started and the motion kept up for three minutes more when the bottles are taken out and the percentage of fat read off by the marking on the necks. The numbers 1, 2, 3, 4, 5, 6, etc., indicate percentages; and one has only to read off the number of spaces and fractions of spaces covered between the top and bottom of the fat layer to get the percentage of fat contained in the sample of milk. If the lower fat line is at one and four-tenths, and the upper fat line at five and three-tenths,—the difference between the two readings, or three and nine-tenths is the percentage of fat contained in the sample. The milk flasks are graduated up to ten per cent. We have had one sample of milk here to-day that tested nine per cent fat. It was from a cow long in milk, that was giving only about two quarts per day.

The Babcock milk test has been widely introduced in the butter factories of the Western states, as a method of determining the butter value of the milk furnished the factories by their patrons. An agreement is made between the owners of the factories and the patrons, that a certain price per pound shall be paid for the butter fat contained in the milk as determined by this test. If one patron furnishes a milk containing six per cent of butter fat, and the stipulated price is twenty-five cents per pound for the same, that man receives one dollar and fifty cents per hundred pounds of milk. If another man furnishes a milk containing four per cent of fat, he receives one dollar per hundred pounds of milk furnished.

In this State the conditions are somewhat different. The creameries buy cream, not milk and this little flask is not adapted to creamery work because it only measures from zero up to ten per cent and cream raised by the different methods in vogue in the State, runs from fifteen to twenty-five or more per cent of butter fat. Prof. Bartlett of the experiment station has modified the milk flask by making a bulb in the neck of the flask, thus increasing its capacity to twenty-five per cent; so that the Babcock test is now applicable to the creamery business in this State.

Many farmers have suspected that, by the pooling system in associated dairying, each and every man was not getting out of the business just what belonged to him. Some have thought that there is a difference in the value of cream from different herds The rule has been that two inches of cream makes a pound of butter; but we have dairymen who have found that an inch and a half of some cream make a pound of butter. It has also been found that it sometimes takes more than two inches of cream to make a pound of butter. These farmers and dairymen have been asking the experiment station to devise some method of correctly testing milk and cream so that strict justice could be done to all patrons of butter and cheese factories. The Babcock Milk Tester is one of the devices brought out by the experiment stations for the work. It has the merit of being the easiest to manage. Any bright boy or girl of thirteen or fourteen years who is fairly careful can do the work accurately. So there seems to be no good reason at the present time why the patrons of the butter and cheese factories of the State should not receive pay for the milk or cream furnished by them in accordance with its just value.

The proprietor of the St. Albans Creamery has had a Babcock tester, adapted to creamery work, in operation for several months, and though he was very doubtful of its superiority over his oil churn test before using it, he is now one of the strongest advocates of the Babcock system. I believe that it is practicable and that we shall be obliged to adopt it.

If there are no questions on the machine, I will report on the samples of milk which have been tested.

There were five samples of milk brought in by S. M. King of South Paris. In each case, the milk was strained into a bowl and the sample taken by submerging the bottle in the bowl.

Sample No. 1. A cow seven years old; thoroughbred Jersey; dropped her calf January 3, 1892. This sample gives 3.2 per cent fat.

Ques. Please explain what you mean by 3.2 per cent of butter fat?

Ans. That one hundred pounds of milk will contain three and two-tenths per cent of butter fat.

Ques. Do I understand you to mean that the hundred pounds of milk make three and two-tenths pounds of butter?

Ans. It will make more than that. It would be fair to say that good butter contains eighty-five per cent of butter fat; by the best system of skimming, you would leave two-tenths per cent of fat in the milk. You would have three per cent of fat that would be available for butter making. That would be three pounds in a hundred, of butter fat.

That would be eighty-five per cent of the butter it would make. It would be about three and five-tenths pounds and a trifle over.

Ques. Would a pound of butter fat make a pound of butter?

Ans. A pound of butter fat would make about 1 1-6 pounds of butter. The second cow, a short time in milk, sample No. 2, gave 3.2 per cent of butter fat. No. 3, longer in milk, gave 5.01 per cent; No. 4, 5.8; No. 5, 5.4. All these samples were from S. M. King.

No. 6, was from P. L. Wyman. Nos. 6 and 7, were both from the same source. They were duplicates of the same sample; both gave exactly nine per cent of butter fat.

No. 8, from the same man, gave 5.2 per cent.

Since I made these tests, two other samples have come in from the Mountain View Farm, and the owners of this machine. A. L. Goss & Co. of Lewiston, have made the tests, giving 5.4 and 6.8 per cent of butter fat.

Ques. What is the temperature of the water put into the flask?

Ans. The temperature was probably about two hundred degrees.

Ques. Why was it necessary to have it warm?

Ans. So as not to cool the fat. It is desirable to have the fat in a liquid condition so it will move readily in the neck of the flask.

Ques. Why did those cows vary so much?

Ans. *By Mr. King.* Perhaps I can explain. In the case of No. 1, the amount of milk the cow is giving, as well as the time the cows have been in milk, comes properly into the consideration and will perhaps explain the difference.

There is one point; I will say about the samples, that I had my milk strainer and immediately after the cows were milked, it was strained into the pan and the bottle submerged and so on all through.

Ques. You didn't get the milk from the bottom?

Ans. That is the way I did it. If it wasn't done right it was my ignorance.

Ques. You took it off the top of the milk?

Ans. I had been milking; it was immediately strained and the sample immediately taken after it was strained. It was strained through a cloth strainer. I wanted to get a fair sample of my milk. I will go through with the cows. No. 1, the cow dropped her calf the third of January; is giving fifteen quarts of milk. That was 3 2. No. 2, dropped her calf December 29. She is giving about eight quarts of milk. Her test was 3.2. No. 3, heifer, two years old. First calf dropped May 21, is to calve April 20, 1892. Sample was taken from a single milking of two and a half quarts.

That was 5.1. No. 4 was a cow five years old, dropped her calf the nineteenth of this present month, (January). Has had nothing but bran and meal up to the present time. Sample taken from eight quarts of milk. Her test was 5.8. She gives about sixteen quarts a day. No. 5, a heifer, twenty-three months old; dropped her calf the seventeenth of the month. Sample taken from three quarts of milk. That was 5.4.

WEDNESDAY EVENING.

Meeting called to order by the President.

PROFITS OF THE DAIRY BUSINESS.

By C. V. Knights, Turner.

Ladies and Gentlemen: What I have to say to-night must be a plain practical talk, concerning the profits to be derived from co-operative butter making, which, rising from insignificant beginnings is now a power in the land and, if wisely and judiciously managed, destined to occupy a still more prominent place in the agriculture of Maine. It has been urged that there is likely to be an over production of dairy products and therefore unsafe to enter upon dairying, but it is now twenty-five years, and I cannot say how much longer, since this prediction was made and we come no nearer its realization to-day than when it was first assumed.

The exports of dairy products for the year ending June 30, 1890 to the West Indies, San Domingo and Brazil amounted to $1,066,156. As these are the countries with which reciprocity have recently been established by the United States Government, it is in these quarters that an immediate enlargement of the foreign market in dairy products is to be expected. So brother farmers let us feed the cows, make first-class butter, and not fear overproduction.

It is a fitting time at the commencement of the New Year to look over the business transactions of the past and see wherein we have made a success in the different branches of our farm operations, and try to avoid the losses in each and every case, if losses we discover. I think there are few of us but will see a chance for great improvement the coming year, if we have kept an account of our business so we can tell just what we have been doing.

I hope the farmers present keep records of their business so they know at the end of each year whether they have made or lost money on the year's work. I have found several in my vicinity who said farming paid, but I am sorry to say, they had not a figure to show from what source they had received their profit. They said they knew it paid, for they got a living, paid the grocer, doctor, and taxes, and had some apples and potatoes left in the cellar more than they should use. Yet after saying it paid they could not tell for a certainty whether they got the profit from the cows, hogs, hens or hoed crops. I fear the greater part of the men whom we hear crying "farming don't *pay*" keep no account or record of the cost of running the farm, or its income. I firmly believe there is no one thing so sadly neglected by the farmers of Maine as farm accounts. They should be kept because without a general debit and credit account with his farm one cannot know with any degree of certainty whether he is making or losing by his hard labor; whether he is adding to his estate or becoming poorer. This every prudent man and honest citizen should know.

A knowledge of this fact encourages one while doing his farm work, for any man will work with greater zeal and put more energy into his business if he can sit down and prove by figures that he is making a profit from his labor.

Many a calf is raised, well fed, housed and cared for and kept upon the farm until old age warns its owner to dispose of it which at no time in its life after it has come to maturity, will pay the cost of keeping it. Brother farmers have we such a cow in our herds? A carefully conducted test of each cow once or twice a month will at once correct this error and suggest which one to send to the butcher, if any, and it most always points where you least expect it. In any other pursuit than farming, bankruptcy would speedily overtake the one who managed his accounts so carelessly.

I do not propose to present any specific system or manner in which such accounts should be kept but only suggest and insist that each farmer should adopt such a system as he himself can understand and will give him the desired results.

I hope you will pardon me for wandering so far from the subject assigned me, but think you cannot help admitting the necessity for keeping correct accounts if we expect to obtain the profits of the dairy with any degree of accuracy.

I have talked with several farmers in my vicinity who have kept quite accurate records of their different farm industries and am thus able to give you a correct statement of the work in their dairies.

One patron of our factory who does not care to have his name given is noted for keeping correct accounts so there is no guess w.r. here. Everything is weighed, measured and figured.

The whole amount received for 4,901 inches cream for the year.....	$558) '
Received for skimmed milk fed pigs	23 (
" " " " calves.....	15 00
" " new milk used in family....	18 25
Total receipts from eight cows and two two-year-old heifers	$615 44

One heifer did poorly and was practically worthless for the summer.

Six hundred and fifteen dollars and forty-four cents divided by ten, equals $61.54, total receipts per cow. Sixty-one dollars and fifty-four cents less $19.80, amount of grain fed to each cow (this grain was bought and kept separate from all other used on the farm) gives $41.74 per cow. He fed cotton seed, middlings, oil meal and some corn and cob meal, feeds hay night and morning, waters at noon. Pasture not extra good. The higher the grade of the Jersey the better it suits him for a butter cow.

This farmer kept an account with his pigs as follows:

Three pigs delivered in pen....	$4 50
One bag of corn meal	1 60
Butchering and marketing ...	4 50
Total	$10 60
Pigs sold for ...	$34 50
Less cost	10 60
Leaving as pay for skim milk fed..	$23 90

Or $7.96 on each pig. He hired everything done but carrying the milk to them.

Walter Lawrence. Number of cows milked, five. One got lamed in pasture so has paid but little for the last four months.

Number of inches cream, 2,194; received for same....	$246 72
Received for veal calf	7 00
" " skimmed milk at two cents per gallon...	43 88
Milk used in family..	5 00
Total receipts from cows........	$302 60
Cash paid for grain fed...	42 60
Total after paying for grain. .	$260 00

Two hundred sixty dollars divided by five, number of cows, equals $52 per cow after paying for grain fed. He fed only $8.52 worth of grain per cow. But all hay used was of first quality, has running water in front of the cows which are high grade Jerseys. For grain, fed shorts and cotton seed meal giving six quarts of cotton seed meal and eight quarts of bran to the five cows per day.

My own experience has been as follows: Number of cows milked, five, one being a two-year-old heifer.

Amount received for 2,213 inches cream	$249 29
Received for two veal calves	12 13
" " skimmed milk	44 26
" " milk used in two families, summer company,	36 50
Total receipts from five cows	$342 08

An average of $68 41.

Grain fed each cow for the year	$12 70
Hay fed each cow 2⅔ tons at $10.00	26 67
Pasturing	5 00
Cost of keeping cow per year	$44 37

Profit per cow, $24.05, after paying for everything excepting labor, and we in Turner think the dressing amply pays us for that. Water once per day, with well water pumped into the barn. My cows are American Cattle Club Jerseys full bloods and grades.

W. S Haskell. Number of cows milked during the year, seven.

Amount received from cream, 3,501 in ,delivered at factory,	$393 84
" " four veal calves	21 00
" " skim milk fed seven pigs and calves,	34 00
" " milk used in family	18 25
Total receipts	467 09
Grain fed cows during year	91 98
	375 11
Receipts from each cow after paying for grain	$53 58

He estimated that he fed 2⅔ tons good hay per cow, 2 quarts cotton seed meal, 3 quarts bran per day for 8 months. Paid for bran an average of $1.15 per hundred, cotton seed meal $1.50 per hundred.

Wants full blood Jerseys for butter cows and his are all registered but one. Waters but once a day.

W. C. WHITMAN, South Turner, Me. Number of inches cream sold to factory, 5,584.

Cash received for eleven months cream	$569 05
497 inches of cream in December estimated at 12 cents per inch.....	59 64
Milk sold at State Fair.	10 00
120 pounds cheese made	12 00
547 quarts milk used in family at three cents..	16 41
84 " " fed to calves at three cents....	2 52
Total received	$669 62

Six hundred sixty-nine dollars and sixty-two cents divided by nine, number of cows, gives $74.40, total receipts per cow; value of grain fed to cows, $172.41; number of cows, nine; average grain feed per cow, $19.15.

Four of the above mentioned cows were two-year-old heifers with their first calves. Three of them were three-year-olds, one four and one seven-year-old. He fed 2200 pounds of cotton seed meal and also fed liberally of bran.

S. W. CARY. Had six cows for the year.

Number of inches cream 4,377; received for same	$497 68
Received for three veal calves	17 86
" " skimmed milk fed six pigs	47 25
" " new milk used in family.............. ..	18 25
Total receipts from six cows	$581 04

This divided by six gives us $96.84 as total receipts per cow. He fed the six cows $177.75 worth of grain or $29.62 worth per cow; $96.84 total income, less $29.62 cost of grain, leaves $67.22.

Now, if we reckon the skim milk worth two cents per gallon, Mr. Cary's total receipts would be $102.84, less grain, $73.22. He likes high grade Jersey for butter cow, wants good size, feeds shorts, middlings, corn-cob meal, all good hay, and thinks he feeds three tons per cow, waters twice a day, warms water in winter.

After looking over the results obtained by the different farmers we find they have received all the way from $41.74 under unfavorable circumstances, to $67.22 under more favorable conditions after paying for the grain fed.

While there is a small profit received at $41.74, those who received from $50 to $67.22, especially the latter, must have realized quite a fair income.

The feed fed per cow varied from $8.52 to $29.62, and we see that the man who intelligently fed the heaviest grain rations, received the greatest returns per cow.

Brother farmers is there not a lesson to be learned from these results? If so let us try and find by careful and judicious feeding the capacity of our cows for making butter, if we are to be the gainers by the experiment.

By patronizing the butter factory and keeping good cows you receive a cash income from each per month, and I can speak from experience when I say the checks come handy.

There is no marketing of butter or exchanging it for goods. It enables you to buy for cash, thus saving a large percentage on your expenditures. You can stay at home and sell the hay to your cows at the highest market price. We have just had it proven to us that they will pay for grain and hay fed and leave us twice a year a barn cellar or shed, full of the richest dressing. The skimmed milk will keep the sty full of pigs which will help add to the pile of dressing. There is nothing we can keep that will improve the farm and orchard like cows and pigs, well fed. It is surprising to see how the farmers have improved and cows multiplied in the vicinity of the Turner Center factory. They have added cow after cow until nearly all have got twice the number they had when the factory started. Some are preparing to enlarge their barns the coming spring. Others are crowded for room and all the time the dressing pile is growing larger and the farms are growing richer.

Having occasion to be riding late this fall on a raw, cold day, through a town where there is a creamery established, the results of which have not been satisfactory to either stockholders or patrons, I was not surprised to see Jersey cows, as well bred for making butter as the average of the cows of Turner, out of doors in the field at eight o'clock in the morning hunting for spears of green grass, on the south side of rocks and trees, but must confess that I was surprised when returning at five o'clock the same day to see them still rounded up by the side of the barn yard, waiting to be housed. In other barns visited, for I was buying stock, I found specimens of our noble Jerseys tied at the lower end of the tie-up with the year olds and two-year-olds, there consigned to eat the orts and pickings of the hay rations, placed there with the young and growing stock, because of their inferior fighting abilities. I presume to say they got a little grain ration but fear their owner scowled when he pushed it into their crib thinking it was wasted. I don't wish to be understood as saying that was the practice with the majority of the patrons of that factory, for they have some men there who give their cows extra good care, but there are enough of the former, together with other small leaks in the management, to spoil the success of the business.

I fear the mistaken idea that good hay and a liberal feeding of bran, middlings and cotton seed meal is no advantage to a cow you wish to make butter from is not entirely eradicated from the minds of all of the farmers of our good old State of Maine. Many who will allow the correctness of the advantages to be derived by the grain feed, don't show it by their practices. Experience has proven that it is an utter impossibility to get something out of nothing; that when you feed just enough to sustain the system and keep up the animal heat you are feeding at a loss.

I think the tests and figures which I have just read will be more convincing to you than any words I may say. There is profit and a steady and growing increase in your real estate by co-operative dairying.

There is one source of profit derived from the system which money knows not the value of, that is, the health and strength of our wives and mothers. Think of the drudgery saved the women by sending the milk to the factory.

It is an utter impossibility to find any help to work in the house, that you can depend upon. I know by observation and one summer's experience the endlesss amount of work there is to take care of the milk of from ten to thirty cows.

Twenty years ago this past summer I worked in the house and helped take care of the milk from thirty-three cows. At that time it was an unheard of thing for a man or boy to help take care of the milk in a private dairy so much so that my associates called me Sissy.

As I now recall the tired look that I too often saw on my mother's face on some of the hot, sultry days in August, I can but feel that it was by far the most satisfactory summer's work I ever did.

I think it behooves the women who are thus benefited by this co-operative system to collect a fund and erect a monument to the memory of the founder of the system, second only to that at Bunker Hill.

THE CHEMISTRY OF THE CHURN.

By Prof. WALTER BALENTINE.

Ladies and Gentlemen:—In order to understand the principle involved in the production of butter from cream in the churn, it will be necessary to consider briefly the chemical composition and physical properties of the milk from which the cream is obtained and of the cream itself.

Milk consists of caseine, albumen, sugar, and mineral matter in solution in water, known as the milk serum, and fat, which is not in solution but emulsified in the milk serum. That is, the fat, in infinitely small globules is held suspended in the milk serum.

An idea of the physical condition of the fat in milk may be obtained by adding a little oil to warm soapy water in a glass bottle and shaking the bottle violently. When the motion ceases, it will be found that the oil has been divided into small globules and evenly distributed through the water; and if the bottle is allowed to stand quietly for a time, the fat globules slowly rise to the surface as the fats in milk do, except that the fats of milk never separate from the milk serum as such. Owing to the adhesion of the milk serum to the fat globules in milk, the globules are always covered with a film of the serum as they exist in milk or cream.

The specific gravity of the milk serum is about 1.035. The specific gravity of the fats in milk is 0.93. Owing to this difference in specific gravity of the milk serum and the fat globules, the tendency is towards a separation of the fat globules and the milk serum. But as before indicated, on account of the adhesion of the milk serum to the fat globules, the separation is not complete when milk is allowed to stand quietly in a vessel. The globules in rising do not free themselves from the milk serum, but accumulate or become concentrated near the surface of the milk and form what is known as cream.

What has been said regarding raising cream by the gravity method applies with equal force to the centrifugal method. In the centrifugal machines that portion of the milk having the geatest specific gravity is thrown to the outside of the bowl as skim milk, while that having the less specific gravity accumulates near the center of the bowl as cream. Cream, then, consists of milk serum containing a larger proportion of fat than milk proper.

It was formerly taught that the fat globules of milk were covered with a solid membrane or skin which it was necessary to break before the fat could be collected into butter and that the principal object in churning consisted in breaking this membrane so as to allow the fat globules to stick together. This theory has been proved to be false. There is no membrane or skin covering the fat globules in milk, and yet the old theory as to the object of churning, contained a shadow of the modern theory. Reference has already been made several times to the adhesion of the milk serum to the fat globules. On account of this adhesive force of the milk serum for the fat globules, it matters not how near the fat globules approach each other in milk or cream, a film of milk serum always separates them unless acted upon by some force outside of themselves. The churning process is in part at least, a process of bringing the fat globules together with force sufficient to squeeze out from between them the adhering milk serum.

In the process of churning, temperature plays an important part. Take the barrel churn. This is filled half full of cream or a little more, and as the barrel revolves, the cream falls from one end of the churn to the other. As the cream strikes the end of the barrel, the concussion must necessarily cause a forcible movement of the fat globules. More or less of these globules will strike against each other. If they strike with force sufficient to overcome the adhesion of the milk serum for the fat globules, they will stick together, provided the temperature of the cream be such as to permit of the adhering of one globule of fat to another.

If the temperature of the cream be as low as °45, the fat globules will be so hard that there will be no tendency to stick together, and the cream may be churned indefinitely without obtaining butter. If two pieces of tallow be taken at that temperature and pressed together they will not adhere; but if the temperature of the tallow be raised to °70 or °80 and then pressed together, adhesion takes place. So, too, if the cream be raised to a temperature of °60 to °70, the fat globules become soft enough to stick together when their surfaces come in contact, and the formation of butter becomes possible on churning. If the temperature be raised high enough to melt the fats in the cream, then again the collecting of the fats into butter becomes impossible. Churning at such a temperature would have a tendency to still further divide the fat globules rather than to collect them in a mass.

If we churn at too low a temperature the butter does not come; if we churn at too high a temperature the butter does not come.

Between the two extremes however, there is quite a wide range of temperature at which cream may be churned and butter obtained. We have reports of °58 as the proper temperature to churn sweet cream; while sour cream is often churned at °70 with good results. The proper temperature lies somewhere between °60 and °70 for most herds, with sour cream. The melting point of butter fats varies from °80 to °104, according to breed and system of feeding.

Consequently the proper temperature for churning a particular cream will vary somewhat according to the characteristics of the animals from which it was obtained and according to the kind of fodder fed to the animals. With most Jersey herds on winter feed of hay and grain, a temperature of °66 to °68 will be found to give the best results. If the temperature goes much above this, the butter will come soft; and at a temperature much below °66, too long time will be required in churning.

With the herd at the College Farm made up of Gurnseys and Jerseys and Jersey grades, we found that a temperature from °66 to °68 gives us our butter in a good granular condition, while at a temperature above that the butter came too soft. With cream from the mixed milk of Ayrshires and Holsteins we were obliged to churn as low as °62, or the butter came too soft.

Each one has to determine for himself the proper temperature at which it is best to churn his cream. In summer this temperature will be found a little lower than in winter, as the summer feeds produce softer butter fats than the winter fodders.

In ripening the cream, it is important that the work be done evenly. If we churn sweet cream, we can go on all right, do good work and get out a good amount of butter; but for some reason, we don't know why, we don't get out as much as we think we ought. It is important that the cream be ripened evenly, because the ripening has a tendency of lessening the time required for churning. Now if a portion of the cream is well ripened and another portion scarcely sour, when the cream is churned, the well ripened will yield its butter first and the result is an imperfect churning and more butter fat is left in the buttermilk than should be. Prof. Cooke raised another point in regard to ripening cream, *i. e.*, that of over-ripening cream. Up to a certain point the ripening process has a tendency to increase the ease of churning; beyond that point the tendency is reversed. This would also result in an imperfect churning if unevenly ripened. To obtain an even ripening it should be thoroughly stirred two or three times a day while the process is going on.

Ques. Would you want the cream in one vat?

Ans. I should prefer to have it in one vat. It is not necessary if you have the temperature of all the vats the same for cream under exactly like conditions, they will go on evenly in all. The trouble in ripening cream is, we do not get those conditions in the different vats. It is better to have it all in one vat because you can control one vat better than three.

Ques. Can you get even ripening to any amount of cream by using steam heat?

Ans. I should be afraid of steam; I would rather have hot water. I am not a practical creamery man; I have never done this work except to experiment. I have made 135 pounds of butter each week for a few weeks and I controlled the temperature by water and by that means I had it perfect. If I let the steam on the vats, it will run the temperature up very rapidly near the steam pipes under the vat. There would be some danger of running the temperature too high, so as to retard the ripening at the bottom while it was going on at the top. I do not know how it is done in the factory; we can control it with the hot water.

Thirty-six hours before churning we put in a little buttermilk that is already soured and mix thoroughly with the cream, stir four or five times a day with the paddle, keep the temperature at 60° or a little above. At the end of thirty-six hours the cream commences to thicken and is ready to churn.

With regard to the churn. The churn that will furnish you the least friction inside is best for the churning of the cream theoretically. *Practically*, we get a better grained butter in the box or barrel churn without inside gearing than with the dash churn. As the butter commences to gather in the churn, it is thrown from one end of the barrel churn to the other. In the old fashioned dash churn it is stirred. It makes good butter but the tendency is for those paddles to rub the butter up more or less into a greasy condition, injuring the grain As a rule we have to work carefully for the fine granular condítition which is easily obtained where there is no gearing.

Governor HOARD. There was a little experiment I had once that brought a flood of light upon the dash churn. It is bigger at the bottom than at the top, which is just large enough to let the dasher in. By the time the dash gets to the bottom there is a space at the outside and as the cream thickens, the agitation is confined to just the diameter of the dasher. As it thickens more and more, there is an outer rim of cream that is not agitated evenly with the centre, and that does not come when the rest of it does. When that in the centre comes and passes into the fluid form it washes the unchurned cream into the buttermilk.

Prof. BALENTINE. We have some trouble with the dash churn forming a layer of cream on top and the chances are that a large portion of this will never be gathered into butter. To be sure, you have a first-class article to make biscuit, but that *shortening* material takes just so much from the *length* of your butter.

Ques. Would you prefer a square, a barrel, or a swing swing churn?

Ans. I like the barrel churn the best. When we have a large business we must have the box churn. For our ordinary dairy use I prefer the barrel churn; because as the churn is turned over and over, the cream does not collect in any place, but is thrown from one end to the other. There are other churns that do practically the same work,—having no inside gear. It is claimed that even in the Davis Swing Churn that the cream collects on the cover and is finally washed into the buttermilk and lost. I have never had any trouble in that respect.

Ques. What is the proper length of time to churn?

Ans. I intend to have the churning last an hour. If I get the cream at a temperature of °66 to °68, the churning usually lasts about an hour, while the churn revolves about sixty times a minute. I think the butter has reached a proper stage of granulation when the granules are about as large as a good, plump wheat kernel. I like the granules about that size; sometimes they are a little larger, sometimes a little smaller. I do not like to handle butter at a temperature of °66 to °68, because it sticks together in washing.

So I cool it with cold water, putting two pails of cold water into the churning of eight pails of cream. I revolve the churn a few times after putting in the water and cool the buttermilk so the temperature of the butter will be lower; then draw off the buttermilk. Then I put in about four pails of water at °60 and stir up the butter granules with the water.

If the cream was properly ripened to start with, two such washings are usually sufficient. If the cream was too sour before churning than it may be necessary to wash the butter more in order to remove the white specks of coagulated caseine.

Ques. If you did not want so much water in your buttermilk would you put in skim milk instead of water?

Ans. I never did it.

Gov. H. Did you ever have any difficulty when the first granulation broke and you stopped churning, to get the butter to rise when you turned in cold water?

Ans. I have not, but I have been making butter but a short time.

Gov. H. People often have difficulty in securing a separation and that difficulty is due largely to the kernel or pellet, so when I pull the stopper the butter runs through with the buttermilk. Now how shall I get a separation? Just make a pail of strong brine, cold water and salt, and turn it into the churn. That adds to the gravity and sends the butter to the top and separates it completely.

Ques. What do you attribute that effect to? Why does the butter all rise to the top?

Governor H. I do not know. All I know, is the *fact.* I have been speculating on causes, but I trip my own heels up every little while. I know how to get over it by the use of this brine. This being so much heavier forces the butter particles to the top.

Ques. Whether the salt would not do the same?

Gov. H. No. I have had that experiment in my creamery. Salt added to the water makes it so much heavier that it forces a complete separation of all the butter particles.

Ques. How do you account for the variations in the granules of butter, some coming fine and some larger?

Prof. B. I am not sure of any explanation for it, except perhaps that the cream has been unevenly ripened; that would make some of the butter come first. That produced first, keeps increasing in size and that which comes later will be in a finer condition. That is all the explanation I can give.

Ques. How do you salt butter?

Ans. I lay out one-third of the granules on the worker and put on a part of the salt, then another layer of butter and another layer of salt; divide the butter into three portions and put the salt between them.

By that system I can get the salt in the butter so it will not be streaked. Then I thoroughly work it with the paddles before I put the worker upon it at all, so I do not see any lumps of salt separate or in bunches through the mass. Then I work it until it comes to the waxy condition that makers desire, and mould it off.

Ques. What makes streaked butter?

Ans. Uneven salting. White specks are caused by not getting out the lumps when you wash butter.

WEDNESDAY EVENING.

VARIATIONS IN MILK AND ITS PRODUCT.

By Prof. W. W. COOKE, Secretary Vermont Board of Agriculture.

Mr. President, Ladies and Gentlemen:

In taking up the subject of the variation of milk and its product this evening, I shall treat it under the following headings:—Variations of whole milk; variations in skim milk; variations in buttermilk, and variations in the keeping qualities of butter. These four subjects I want to take up separately and complete each before taking up the next

The speaker who was to precede me this evening on the programme was to talk on the properties of milk and it may be well to take up two of those properties in speaking of the variation of whole milk.

You are not a cheese making State, but these variations in the fat and the caseine have a decided bearing on the question of whether it would be more profitable to manufacture a certain milk into butter or cheese.

The fat is the part of the milk that determines the commercial alue; the caseine is the part of the milk that allow s for the making of cheese.

Four per cent milk is a fair average and such milk contains about three and one-half per cent of caseine, including under this head all the albuminoids of the milk.

This makes cheese that commands the highest price in the market; it makes cheese that is one-third fat, one-third caseine and one-third water; including in the water, the curd and everything but the fat and caseine.

If you increase the per cent of fat in the milk and make cheese, you get a richer cheese, a cheese that contains more fat. The caseine is the part of the milk that enables you to make cheese but strange as it may seem, it is not the part of the milk that gives cheese ts commercial value. The fat is the part of the cheese you pay for.

You will understand this by considering the price of cheese made out of whole milk with one-third of its weight, fat; and its price if the fat is taken out of it. Cheese made from skim milk sells for about what it is worth as a fertilizer, two cents a pound; whereas if you put in the fat, you get as the value of the fat, from twenty-five to thirty cents a pound. It is the fat that gives commercial value to the cheese. If you increase the per cent of fat above a certain limit, you do not get a correspondingly increased price. In the English market the price increases as the fat increases until up to a cream cheese, for which they pay twenty-eight or thirty cents a pound. If we undertake in this country to make cheese out of milk richer than four per cent, the market will not pay an extra price for it.

You would suppose that you would get more cheese per hundred pounds from rich milk, but unfortunately, much of this extra fat, instead of increasing the weight of the cheese, takes the place, very largely, of the water in the cheese.

When milk gets over four per cent, it is poor business to make cheese out of it; you better change and make butter. If the market would allow us to make butter and cheese both, that would be a still better way, but our eastern market scarcely allows that. If you partly skim the milk, down goes the price. You may educate some particular man to let you do it but the majority of commission men will not allow it.

The variation in fat is the most important variation in the milk, and it is very large. The variation in caseine does not keep pace with the variation in fat. While fat is increased from four to six per cent, adding one-half to its amount, the caseine is scarcely increased more than one-half per cent.

That variation in fat is due to quite a number of causes. The most important as held by some, is *breed.*

I do not mean to say that there is a breed, all the cows of which, give rich milk and another that all give poor milk; but it is generally recognized that some breeds are more likely to give rich milk than others.

Yonder is a picture of a Hereford cow. You would not expect to get rich milk out of a Hereford or out of a Durham cow. Individual Herefords give very rich milk; individual Durhams give rather rich milk. If you are looking for cows to give rich milk, you turn your thoughts to the Jersey or Gurnsey. There are some Jerseys that give thin milk.

At our State Fair, there was a Jersey that gave milk below the legal standard. Yet she came from a fine strain of butter producing cows; and I have one of her daughters that makes a pound of butter from sixteen pounds of milk. You are more likely to find cows giving rich milk among Jerseys and Gurnseys than among Herefords and Durhams.

Lactation has a decided effect upon the quality of the milk.

When a cow is fresh in milk, she gives thin milk; but the farther she gets from calving, the richer the milk becomes. This is true of all cows, of all breeds.

This increase may be rapid or it may be slow. If the cow is well fed so that she keeps up the quantity of milk a long time, the increase is slow. If a cow gives thirty pounds of milk a day when she calves, and six months afterwards, gives twenty pounds, that twenty pounds will not be much richer than the thirty pounds. But if during this time she had shrunk to five pounds a day, the milk will be much richer than just after she calved.

Still another thing which influences the character of the milk, is *feed*. How does feed influence the character of the milk? You would say, give the cow rich food and she will give rich milk; or poor food and she will give poor milk. To properly discuss this phase of the subject we must understand what is meant by rich or poor food. The effect on the quality of the milk that results from throwing a cow into a fever by unhealthy feed, or the results from any unnatural feeding should not enter into this discussion. There is no man sharp enough to tell beforehand what the effect of either abnormal feeding or starving is going to be upon the quality of the milk. Take a cow that is giving a certain quality of milk under good feed. If you starve that cow you cannot tell beforehand whether she will give richer or poorer milk. She will give *less*, but whether a less amount of better or poorer, or less quantity of a richer quality of milk you cannot tell beforehand. No one can tell what abnornal conditions will develop. If you feed a cow in an unhealthy manner, —throw her into a fever by feeding to excess with cotton seed meal; —you may get better or poorer milk.

What is the effect of normal changes of feed? As for instance, when you change from barn to pasture feed. If you treat your cows in a humane way, you are in April feeding them good hay and some grain, in a good, warm stable. When you change from that to pasture feed, you change from one good feed to another good feed. Now will that effect the quality of the milk?

The majority of this audience would probably claim that there will be an increased quantity of milk when cows go out to pasture; and that this increase will be accompanied by a decrease in the richness of the milk; also a decrease in the total solids of the milk. This audience would probably give a three-fourths majority vote in favor of this proposition;—that there is an increase in quantity of milk, a decrease in per cent of fat and in per cent of total solids.

We have put an immense amount of work on this particular question,—on the influence of the change from barn to pasture.

We have tried it on individual cows and on our herd as a whole. We have tried it on more than thirty herds scattered around in different parts of the State. We have tried it from good feed in the barn out to pasture, and from poor feed in the barn out to pasture, and we have obtained two sets of results. If the cows were well fed in the barn, there is no change in the pounds of milk required to make a pound of butter; it is about the same on pasture as in the barn. You get a larger quantity of milk, but the quality remains about the same; if the cows have been fed no grain in the barn, or if they have been fed hay, with but a limited quantity of grain, there is an increase in per cent of both fat and total solids, in addition to the increased quantity of milk; not only an increase in pounds per day of milk but also in the actual richness of the milk. We have not found any case of a herd in which the per cent of fat dropped. That is contrary to the opinions of the farmers. The ordinary expression is, that wet feed makes thin milk; that you water the milk through the cow, instead of watering it from the pond.

Now what is the effect when you change from one good feed to another?

I have many times asked an audience to give me a ration which would make a cow give rich milk and one that would make a cow give thin milk.

It would be difficult to find a ration on which three farmers would unite in thinking that it would make rich milk, and a ration which would make poor milk.

That question has been asked in different audiences, at different places and there is not a single feed that is given to our dairy cows, but you can find men who say that that feed reduces the richness of the milk; and others who will insist that it will increase the richness of the milk.

If you take a hundred cows and feed on any combination of good, healthy feed, and then change to some other healthy food, you will get, as average of the whole, no change in quality. You will find individual cows that change both ways; some increase and some decrease.

You will find some that have a tendency to richer milk;—select those and breed from them. That is just the way improvement of breed takes place. Take these extreme variations and increase them; strengthen them by selection through many generations.

By feed and selection you can change the character of the milk as much as you like. You can take a herd of Jerseys that give a small quantity of rich milk and by selecting those that give a large quantity of thin milk, rather than a smaller quantity of rich milk, in the course of many generations, get milk with a small per cent of fat.

I think we can take the Holstein and in twenty generations make a butter cow of her. This could be done with the Holstein much easier than the Ayrshire, which are the most firmly fixed of any breed. If men would take time enough, the Holstein might be quite easily moved; you will find a large variation in the breed; its system does not seem so fixed as the Ayrshire or Durham. Quite a number of them have been changed by feed and care and selection, until there are herds of Holstein that actually give rich milk.

Ques. Would the Holstein continue the flow of milk as before?

Ans. Not to the same extent; not in quantity. When a cow increases in richness, she begins to decrease in quantity of milk and in size of the animal. It is the natural tendency of giving rich milk, to have finer bone, finer hair;—a smaller boned animal.

Ques. You intimate in your reasoning that if the cow has been well fed, fed up to her standard or limit, there is but little change.

I think you are sound, but is it not a fact that scarcely any cow has a chance to get to her level?

Ans. There are a thousand that never get there, where there is one that does. You take a hundred cows;—beforehand, you cannot tell which will decrease and which will not.

There is one point which I believe is a fact; that no experiments have ever been made to answer the question as to the effect of high feeding on the composition of the milk of the cow that gives excessively rich milk;—that gives eight to nine per cent of fat under ordinary conditions. I think there has been no experiment published which gives the per cent of fat in such milk under excessive forced feed. We have quite a number of such tests on record where the butter has been weighed, but we know nothing about the amount of water contained in that butter, hence, can only guess at the composition of the milk.

With regard to skim milk, there is a popular misconception of the relative value of the skim milk from different breeds. I have heard it stated repeatedly that those cows, or those breeds, which throw cream up easily, leave blue, thin skim milk not worth carrying home; whereas other cows, like the Ayrshire and Holstein, do not make so much butter, but give a skim milk of high feeding value. The claim is made, that in comparing breeds it should be taken into account, that the skim milk from the Ayrshire or Holstein, is not only more in quantity, but is worth more per hundred pounds than that from the Jersey or Gurnsey.

The fact is, that the value of skim milk varies according to the butter value of the milk. You cannot make thin skim milk from milk having a high butter value.

Milk containing three per cent of fat, will have a certain value of skim milk. This value will be increased whenever you increase the butter fat. The value of skim milk from butter breeds, is higher than skim milk from milk breeds; but this difference is so small you can throw it out of the account and consider that the skim milk from all breeds, has equal feeding value.

The next matter to consider is the variation of the fat in the skim milk. The principal cause is differences in the methods used to obtain the skim milk.

There are three different methods in use; the shallow setting, deep cold setting and the separator. These are the three in the order of time and also in the order of efficiency. Now I do not want you to believe what I say, merely because I say it; but I want to set you thinking and get you to test the skim milk of your herd during the next year and ascertain for yourselves whether you are getting all the fat out of the milk that you should.

We claim in Vermont to be a dairy state. The milk in that state is still handled principally by shallow setting. It is not creditable to her, but it is a fact. I do not know how it is here, but I imagine shallow pans can be found here. There is no use claiming that shallow setting will take out all the fat. It is not a good method to get the fat from the milk if you can possibly use any other; because it does not do good thorough work.

Shallow setting is best used in a small dairy, when the cows are in the flush of their milk, in May, June and July; when the ordinary temperature of the air is up pretty near where you want that milk. Nature is on your side in making it easy to keep the milk warm.

If a man has specially good facilities, an extra nice dairy house and running water, so he can control the temperature, everything just right, he can do fairly good work—*only* fairly—in getting all the fat out of that milk in shallow setting.

As the August days come, shallow setting does poorer and poorer work. When October and November come, one is fortunate if he gets three-fourths of the fat out of the milk. With winter dairying, shallow setting is practically out of the question; it cannot handle winter milk with any satisfaction. Nature then is against that method; artificial heat must be employed and it is difficult to keep the temperature even.

The next after shallow setting comes *deep*, cold setting. It is a great step in advance from warm, shallow setting. At the time, summer, when shallow setting is easiest to run, the cold deep setting is most expensive, since artificial cold is needed. There is a good deal of dispute about the amount of cold necessary to make deep setting do its best. It is taught that if one has running water at fifty degrees, he does not need to use ice; he can go into cold, deep setting and get good work without using ice. Now this is a delusion and a snare. If you test your skim milk you will find you cannot get the fat out of the milk at fifty degrees.

The difference in the length of time the milk sets makes little difference in cold, deep setting; the fat comes up in twelve hours. What comes after that is not more fat but a settling together of the cream. If you set milk at sixty degrees you get more change than at forty degrees. If you set at the proper temperature, you get all the cream in the first twelve hours and get within 4-10 of one per cent of the fat in the milk. It is seldom you get over that. That wastes four pounds in a thousand pounds of milk.

I would not want to try cold, deep setting, unless I could get the water down to forty-five degrees. I should be afraid of thirty-five or lower degrees, an account of chilling the cream. I think it is liable not to handle well afterwards when cooled to that point. There has been a good deal of discussion upon the subject, but we do not know much about it. I should not advise cooling below forty degrees.

I know men who let the milk freeze up solid; and I have known the butter made by freezing the milk, to take a high premium in our State Dairyman's Association; but I should not advise that as a system. One man in a hundred might do it, ninety-nine would fail.

Milk is not like water; water shrinks as you go from a high temperature to thirty-nine degrees, then expands until you get to the freezing point. Milk, as a whole, contracts down to the freezing point and just before it freezes, it occupies less space than at any other point.

You will get a more complete separation, the colder you get it, down to forty degrees.

I have no patience with paying for cream by the measurement of the cream on the can. I do hope the system is soon to be a thing of the past. It is so unfair; there is such a variation in the butter value of the cream measuring the same in depth. I hope it is very soon to be supplanted by paying for the cream by its butter value as determined by the Maine Experiment Station modification of the Babcock test.

Ques. Can you make more butter where the cream is raised at a low temperature?

Ans. You can, providing it does not interfere with the ripening of it. I am afraid of the low temperature. The higher the temperature at which the cream is raised, the more it settles together; the lower the temperature at which it is raised, the more bulk it will have.

Ques. More fat out of a hundred pounds?

Ans. Provided the buttermilk is the same, you will get the more butter in the lower temperature.

Ques. Are there any reasons for the more perfect separation of milk by rapid cooling?

Ans. It is that rapid cooling that makes the cream rise. The more you can make the temperature come down, the farther down you get it the more the cream will rise. The force is the difference in the weight of the fat and the skim milk. The quicker you can bring down the temperature, the more force you exert, the more thoroughly you bring up the cream.

There is one question comes in here. It has been held, over and over, by those who use cold, deep setting, that they do not want to get up the last little bit of fat in the milk. A good dairyman has told me that he knew that he was losing some fat in his skim milk, and he wanted to; because he could not make good butter of the last fat to rise. This is an idea that is widely believed; and if the milk is handled under the ordinary system, this belief is correct. If you set milk twenty-four hours and skim off the cream, then set the skim milk another twenty-four hours and skim again and make a second lot of butter, you will not get so good butter out of the second lot as the first. It is not that the fat is not as good, but the extra aging and handling you have subjected the butter to. We have tried taking off the bulk of the cream, then running the skim milk through the separator and making butter from that and find we can make a good quality of butter from that last part of the fat.

So I think we can say that there is no difference in the character of the fat in the milk;—that one part is as good as another if you get it all off at one skimming.

Ques. What would be the effect of carrying the milk and setting it into ice as quickly as possible, would it be of advantage over allowing it to remain in the barn any length of time after milking before setting in the tank?

Ans. It will not improve it to let it stand. Just how much it is injured, depends upon the chance to absorb odors and the temperaature to which it drops. If standing in a warm place in summer so the temperature is lowered but little, you will get practically no difference in the cream, although it has been left half an hour before setting.

If you do this in winter when the air is cold, so it is down to seventy-five when put into the water, you will find a loss in the skim milk from your delay in setting. Get it into the water just as soon as you can, after it is drawn from the cow.

The other form of getting cream is by the separator. This is not a separator country. Separators are a comparatively new thing; I do not know as it would be well to spend much time in talking about that. The separator is bound to come. In five years you will be using the separator. It is just certain to come; and as long as it is coming it is well to know that the separator will be an advantage to you when it comes. It will skim closer than you can skim in any other way and give you the cream in the best possible method for handling subsequently. Just how it will come, in the form of the creamery or in private dairying, only time can tell. The separator is sure to be introduced in the private dairy. More than fifty of them in Vermont, have gone into private dairies within six months. They do the work; skim the cream out clean.

Whether any particular farmer should get one or not, is a question I cannot answer. If a man has but three cows, it would be foolish to get a separator. Under ordinary conditions, a man with twenty cows, cannot afford *not* to have a separator.

The machine turns easily with one hand; I can turn it and not tire me. I can get along first-rate for thirty seconds; then I want some one else to take it. It is not *hard* work, but *tedious* work. Any one who buys a separator thinking it is easy work, is mistaken. It is like churning every day, or turning the grindstone an hour or two a day. I can hire a man to do it well, though he knows beforehand he is going to turn that separator; but I don't like to do it myself.

Ques. Is this separator here, large enough for twenty-five cows?

Ans. Yes; it is the No. 2, and is large enough for a dairy of twenty-five cows. It is not necessary for this to be turned by hand; it could be turned by horse, goat or dog power. I know one man in our State who runs it with a Jersey heifer. He has it in his barn near the stanchion. He has the heifer taught and all he has to do is to loosen from the stanchion and she walks into the power and makes it run as long as he wants to, when he shuts down the brake she gets off Each farmer will have to determine for himself whether his conditions are such as to warrant the putting in of the hand machine; but I feel sure that it is bound to come before many years. You may as well get your eyes and ears open to know whether you are the one who ought to be next to adopt it.

It does not necessarily mean, that you run the milk through the separator twice a day. It is an advantage so to do, in order to have warm skim milk for feeding purposes. You can as well hold the milk over and separate once a day.

Ques. Under the head of shallow pans, do you count the Fergerson bureau creamery?

Ans. I counted the Fergerson in as one form of shallow pan; it does not skim any closer than the Orange county pan or than several other forms of controlling the temperature by water instead of by air. Although the Fergerson is an improvement, I do not think the system is perfect by any means.

I said that the variations in the fat in the skim milk, depends particularly on the method used in getting it out. It does also depend upon the period of lactation of the cows. This is an important point to bear in mind, in connection with the shallow or deep setting. When a cow is fresh in milk, the cream comes up easily; almost any system will get the cream. Hereford milk will clean down to 30 per cent, in cold setting.

But it is certain that the further the cow gets along in lactation, the more difficult it is for the cream to come to the surface; and towards the latter part of the cow's period,—for the last two months before she dries up, neither shallow, or deep, cold setting can get the cream; no matter what the temperature is.

Now comes in the effect of diluting milk. We get the best results by adding water at 135 degrees. By adding a quart of that water to three or four quarts of milk, you can get a good separation, set in cold, deep setting, in water between fifty and fifty-five degrees. By thinning the milk it is not so necessary to have extremely cold water.

Ques. What is the effect of heating milk to nearly the scalding point, before setting?

Ans. It may do well in some cases; but in the average for the year you will not gain much.

Ques. If the milk becomes cold before setting can you warm it up and get the same results?

Ans. No; you cannot get the same result. It is better to warm it if it gets too low; it is better to get it to a hundred degrees; but the results will not be so good as if set directly from the cow.

Ques. Will the separator separate strippers' milk as well as that from fresh cows?

Ans. We have been experimenting on that. We have four cows that all ought to be dry now; they are due to calve in less than two months. We have tried running the milk through the separator; then setting in cold water; then through the separator, back and forth. From cold, deep setting, we got over one per cent of fat in the skim milk, more than from the separator. The separator is no respecter of persons; it takes the milk, regardless of breed, time of year or period of lactation and compels the fat to come out.

Ques. With regard to skim milk, you said the skim milk from six per cent milk was better than from three per cent milk?

Ans. There is a little more caseine. Skim milk from six per cent milk will have a little more caseine in it than the other; the ash and milk sugar are also a trifle more. As I said before, the difference is not enough to speak of. I would give just as much and no more for the skim milk from three per cent milk as for that from the six per cent.

Ques. In the matter of skimming milk, you said you were going to tread on our toes?

Ans. I think the larger part of Maine has cold, deep setting; you will have to change to the separator.

With regard to the question of buttermilk—this is to me the most interesting part of the subject because it is the part on which at the present time we are at work; *i. e.*, the question of the making thin buttermilk. We know something about separating milk and controlling the skim milk, but when we get to handling the cream so as to make all the fat go into the butter and leave little or none in the buttermilk, we do not know much about it.

There is almost no first-class churning done,—I mean churning that takes the fat out of the cream completely, so as to leave the buttermilk as thin as skim milk. You can tell from experience whether or not you are doing a first-class job of churning. Think back in your own household and see whether the housewife looked forward to churning day as a day when she was going to have buttermilk to make biscuit and for general cooking purposes. If she uses this buttermilk for cooking you are not doing good work churning; for if you did a good job churning, she would not use the buttermilk any sooner than she would sour skim milk. You ought to churn so your buttermilk will be as thin as skim milk. It can be done if you get the cream evenly ripened. It seems easy but it is exceedingly difficult to get every part exactly alike. The cream from shallow setting is the most difficult to handle to get good churning. I will say that it is almost *impossible* to handle milk under shallow setting and get respectable churnings; because you cannot get the cream mixed so every particle will be like every other particle. The housewife stirs the cream but she does not mix it perfectly. If she ran it through a fine strainer she would find lumps, and those lumps are not exactly the same ripeness as the rest of the cream. When you churn, the lumps will act differently from the rest; when most of the cream has come to butter, some of the particles have not and will go off in the buttermilk.

Ques. Suppose a man gets a little more and a little better butter from shallow setting than from deep setting? What would you say to that?

Ans. I should say that somebody did not understand his business.

Ques. If you get butter and weigh it and know you have a little more from the same amount of milk, it is difficult to prove that you have not got it.

Ans. A single test ought not to be taken as a criterion. I am willing to try a system for a year; and cold, deep setting would go ahead of shallow setting; and I know the separator will go ahead of either. Why do we ripen cream? If I had asked that two or three years ago, you would say,—If you churn the cream sweet, you will have to take the buttermilk and churn it over. That was true according to the light we had then. We know now it is possible to take that sweet cream and churn at ten degrees lower than is customary with sour cream, and make just as complete a churning; have the butter come as soon and in as good condition as if you had soured it. So we do not sour cream to make a more complete churning.

We want to get clearly in mind, the different ways of ripening cream. Good cream from cold, deep setting, as the separator, comes to you sweet; it comes about even; you do not have clots of dried cream; you have a smooth, even cream. Now you can handle that in four different ways. You can churn it sweet and get a good, respectable churning out of it; or you can sour that without ripening it.

Notice the idea that there is a difference between ripening and souring. I have met men for a number of years who thought there was a difference, but did not know what the difference was. We know now, that there is a difference. You can sour cream without ripening it, by shutting it away from the air and adding the lactic ferment in the form of sour skim milk and thereby make a sour cream that is not ripened. That is the second way. Or you can take the cream and ripen it *without* souring it. Fourth, you can both sour and ripen cream. This is always done in the shallow setting because the cream is always ripe and sour. One with cream from the cold, deep setting or separator can take any one of these four methods that he likes.

It depends upon the customer which he will take. You will take the method which your customer wants. If he wants butter of rank, sour taste from over-ripened cream, give it to him; it does not make any difference to you. If he is willing to take a butter made from sweet cream, by all means give it to him.

Butter made from sour cream is of high flavor; a little of it goes a long ways; you do not find men spreading it thick on one side and then turn over and spread on the other side. Give that man butter from cream churned when a little less and less sour and until you reach sweet cream. It takes more and more to spread his bread as you get toward the straight sweet cream butter; it takes more butter to last his family a week. Now this is not mere theory. We have gone through with it.

If your customer sends in an order for butter salted half an ounce to the pound, you will be better off; because if you sell him an ounce and a half of salt, the salt draws out more water and you have given him more butter fat that if you sold half an ounce.

But that is not the principal thing. The principal thing is to increase your market. If you could get the people of the United States to decrease salt to half an ounce and make all the butter of sweet cream, you would find an enormously increased butter market in the United States. It takes so much more in using mild flavored butter.

The other question is with regard to the keeping quality of the butter made with the creamery as compared with the private dairy, of sweet cream instead of ripened cream. If a hundred tubs of each kind of butter is sent to the Boston market, the creamery butter will want to be eaten sooner than the dairy butter. I do not mean but that the private dairymen make just as good butter as the creamery in every sense of the word. The butter that receives the highest price is private dairy butter, but on an average, creamery butter commands more than private dairy butter. But it is a fact that the creamery butter does not keep as the butter our grandmothers made and packed down for family use. It is one of the demands of the present market. It must be put upon the market in a condition that it cannot keep. It is not the fault of the man who makes the butter; it is the demand of his customer. If your customer is willing that you should spoil the grain by over-working the butter, packing it hard as your mothers used to, when it was slapped in one hand and then in the other until it was a ball, not quite as hard as a rock, but perfectly compact. It kept. The air and water were worked out of it,—it was in good shape to keep. If you were to put that upon the market now, you would get only eight to ten cents a pound. Dealers would say it was over-worked. The market wants butter with a grain that is bright and sparkling. The air is in it and it goes to destruction very soon. That is the fault of the taste of the customer and should not be laid up against the creamery man as the fault of the butter.

The creamery has come to stay; and sooner or later a large part of the dairying of the United States will have to be in the creamery.

Ques. Have you discovered the same variation in the butter-making qualities that exist in the separator as in the cold setting?

Ans. It is difficult to determine that point.

Ques. As a rule, the separator cream churned more exhaustively than any other?

Ans. It *ought* to, but I think if you take an average of the analysis we have made from the separator creameries and Cooley creameries, there would not be much difference.

OUR LATEST CONCLUSIONS IN CREAMERY WORK.

By Hon. W. E. Hoard.

Ladies and Gentlemen:

I will have to ask the indulgence of this audience for my talk. I have been laboring under a severe cold, and as the Dutchman says, "It gets no better very fast."

I made my to-day's talk *yesterday* by a sort of misunderstanding and so will talk to you to-day along the line of some of the latest conclusions in creamery work. It is quite evident, as Prof. Cooke said last night that the progress in butter making is towards co-operation. Nearly 999 per cent of all the cheese made in the United States is made in co-operative factories; but little is made upon the farm; and the progress is just as strong in the direction of making butter for commercial uses. It becomes us to secure, if possible, good judgment as to the latest conclusions in the progress of dairy science.

We are fast reducing dairying to a science; and science is simply knowledge of the laws which govern applied facts; or applied knowledge governed by facts. I can probably do no better than to give you a sort of epitome of our work at Fort Atkinson. We strive to be on the advanced round all the time, adopting all the facts and conclusions that are true. We have spent considerable money to prove facts that did not prove to be facts.

Now you know the system always has been, for the milk to go into the cheese factory upon the pound system; you brought a pound of milk, I brought a pound and each man was given a dividend of the result according to the pound weight of milk furnished. It was known all the time that this was an unjust system and that it was productive of a great deal of mischief among the patrons. It was a kindergarten of petty larceny in which we all went to school; and a great many of us—I am not putting on any assumptions of morality—a good many of us learned very rapidly.

Now a system that is so vicious as to break down the moral fibre of the average farmer, ought to be indicted, imprisoned, executed or banished.

That has been the character of the system of pooling milk in cheese factories. There was a constant growth towards adulteration of the cow, and of the milk. Men would not be honest with themselves, nor honest with the cow, nor honest with the milk. Each man suspected his neighbor and said to himself "all the protection I can get, is to set a back fire."

Now that system has been a vicious one and under the growth of knowledge it is going to disappear. The invention of the Babcock test is going to do more to put co-operative butter and cheese making on an honest basis than anything that has ever happened.

A man jumped up in the Iowa Dairy Convention last November and said, "I tell you the Babcock test can do more than the Bible to make a Christian honest. I have tried both; I have quoted Scripture. Now I have the Babcock test I can beat the Scripture all hollow." You see he has quoted Scripture in the wrong place. The plow will beat the Bible all hollow in sub-soiling land. We want to use the Bible where it belongs; and the plow where it belongs; and this is where the test belongs. The system has been a vicious one; it has caused farmers to feed and breed toward poor milk, not good milk If we start a cheese factory in any part of the country, for the first year or two we can make a pound of cheese for ten pounds of milk; but in two or three or four years, it takes more and more milk. What is the matter? The system is wrong for it has corrupted the people.

We have been running the Hoard Creamery since 1887; we have now four other creameries. We wanted to start in right. My son and myself had frequent consultations. We knew the test system was right and we wanted our patrons to know it also. We take the milk and make it into butter for four cents a pound and return to them the skim milk and sell the butter for them;—do all the work, put it into packages, furnish them commercial skill, get a good market and have all the expense to bear.

We turn over to them every iota of the profit less four cents a pound. But we saw that the tendencies were wrong.

Every day, since 1887, when we started we took a test; but we could not get them to divide on the test, or on the proportion of butter fat each man furnished. Last April we started in for a campaign to secure good, honest work all around. We called those patrons together. They generally understood that we wanted to do right by them—the majority of them did; but they didn't know whether the test was just safe or not. We assured them it was, and and they took a good deal of stock in what we said. They asked us separately, "Do you believe that it will divide rightly every time?" "Yes, if we make good tests; and you can trust us in testing as you trust us to weigh the milk. You ask if the scales will weigh rightly. I say yes, if we handle them right. You must trust us to sample and test this milk; we must have trust in one another all along the line." There were a lot of kickers who acted rather suspiciously. There is a selfishness that will make a man act foolish; I do not say what sort of a man it advertises him to be; but there were selfish men there who would not agree to it.

We finally made them this proposition. We will place two vats in the creamery. Every one of you who want to be judged according to the honesty of your product shall go into the test vat; and all of you men who want to pool together on the pound basis shall go into another vat; the sheep on one side and the goats on the other.

It was amusing to see how quickly the "kickers" rejected that alternative. They did not propose to associate together;—they could not trust each other. They went in to the test. Of course there was a certain amount of friction to overcome,—as the boy said when he was breaking flax,—he guessed he hadn't got the hang of the barn. It took a little time to get the hang of the machine; but it soon drifted into intelligent shape.

We took from 16,000 to 20,000 pounds of milk a day in the flush of the season. We are now taking about 15,000 pounds of milk a day. Nearly all the cows calve in September or October.

A patron will say, "You can't make me believe that small sample tells all the butter in my milk." But they can test in that way among themselves, and thus see that it comes out all right. A sample of milk is taken from each patron's delivery amounting to 17.6 cubic centimetres in quantity. This quantity is determined by a graduated pipette. Each patron has a bottle bearing his number into which this sample of milk is placed. An equal quantity of sulphuric acid of 182° gravity is put into the milk. The acid effects a partial chemical separation of the fat from the other solids and the water of the milk. The bottle is then placed in a centrifugal whirler and an additional separation is effected by mechanical means. Hot water is then turned into the bottle and the separated fat rises into the graduated neck of the bottle and the percentage of butter fat in that milk is read off. Each one per cent of fat means a pound of fat avoirdupois in each one hundred pounds of milk. In our creamery we take a third of 17.6 centimetres each day from the patron's milk and put it in his bottle. At the end of three days we have the full 17.6 centimetres of milk. We then test and credit the patron for all the butter fat he has furnished for the three days.

If I find on the little scale, four per cent of butter fat, and the patron has furnished a thousand pounds of milk, I know that in a thousand pounds of milk there are forty pounds of butter fat. Then I credit him with a thousand pounds of milk and forty pounds of butter fat.

A. comes in with another thousand pounds of milk. His milk tests three per cent. I credit him with thirty pounds of butter fat; he has put just that into the pool, no more.

We ran along during the summer; it began to show clearly to those men that they were having exact justice done them. I will give you a few figures for October.

The average dividend was $1.28 per hundred pounds of milk; and the difference in value was as follows: The lowest was $1.10 and the highest, $1.61. You see there was a difference of fifty-one cents in the value per hundred pounds of milk.

Now the consequence was and has been, that I have seen more progress of the grace of this new gospel in the hearts of these men in the last year, than I have ever seen before. Six months have rolled by and my neighbors come into my office in scores to-day, who were always carping and sneering and saying, "You do a great deal of preaching; but what do you *know* about it?"

I could not convince them, but that little *eye opener*, that test, is getting its work in ; it is leavening that lump. Now what do they say? "Men and brethren, what shall we do to be saved?" They ask, "How shall I better manage my herd ; my milk is not as profitable as my neighbors." They go to the list, we test once in three days and the sheet is nailed up for inspection and the hundred patrons can look on the sheet and there read their own tests and the tests of their neighbors ; and that comparison has reached in and quickened the intelligence of those men, as nothing ever has done.

Now this test is a wonderful eye opener. The result upon our people is they are beginning to turn their attention toward the correction of these leaks that make them get only $1.10 per hundred.

General Burchard, with his herd of registered Jerseys, would not bring his milk there to be pooled. His milk contained 6½ per cent of butter fat ; and he would not pool with the milk of men who had only 3½ per cent. Now General Burchard pools with the rest. He has the richest herd in the county ; but he can go into the common creamery and pool with everybody and find exact justice done him. If a man is foolish enough to water his milk or skim for cats or company,—if he does anything with the milk that is not right, that little test tells the story.

Now, my friends, I want to congratulate you that this gospel tide of combined honesty and intelligence is mighty ; the way is growing better and brighter. I never enjoyed my work so much in my life as I do to-day in my companionship with these men. We are now on a basis that is right.

Ques. Does every man have a chance to bring in his own sample?

Ans. He cannot do otherwise ; we take it out of his milk. I will show you how the sample is taken. For instance, here is a driveway ; a man comes with his milk in the morning, say from six to nine o'clock ; a long string of teams standing there waiting, one after another delivering their milk ; then they drive around the creamery at the lower side and take the skim milk. We have two separators running, which gives them the skim milk as fast as they bring in the full milk. When a man brings in milk, it is turned from the can on his wagon into the receiving can, and that stirs it as nothing else would, pours it all together. The man stands there ; it is weighed and the weight recorded and the milk starts down along the open tin spout into the receiving vat. As it runs over this tin channel,—or a tin trough, midway towards the vat, a hole is punched in the channel with a scratch awl and a little plug put in. The plug is pulled out and as the milk begins to run over the hole, the milk drops through that hole into a jar underneath, a drop of milk for every pound.

We have secured in this way a thoroughly mixed sample; one that thoroughly represents the whole milk. Milk soon changes its relations; the top will soon be a little better than the bottom, so we must secure a thoroughly honest sample.

We devised this system and found it worked, by proof. That little jar sets under the hole and takes sufficient milk for each man's sample. This is our system of testing. We have a pipette that holds 5.9 centimetres of milk. This is one-third the size of the 17.6 pipette. We take a sample from each one, and test once in three days. Although I spoke of that before, I will explain a little farther. We take just one-third of 17.6, this morning. To-morrow morning we take up another third and put in and the bottle is two-thirds full. The next morning we take another third from this patron's milk and that completes the 17 6 centimetres. Then put in the sulphuric acid and test it. This gives an accurate test of the butter value of his milk for three days. We test once in three days and sample every day; which saves us expense and is just as accurate; for we have proved it by testing every day; making one prove the other; we found we came out just the same.

Everything we try to prove, and hold fast that which is good. Now in this matter, the effect upon the patrons has been marvelous. I want to show you just what the fact has been so you will see. (Speaker produced a paper.) I have used this so much since I drew it off, it is pretty well torn. Here is the statement of the value of our milk for the months of April, May, June, July, August, September and October for the five years that this creamery has been in existence at Fort Atkinson.

We started in 1887; we have tested every day since 1887. We tested by the Short process first, by the Babcock now. This is for four years, from '87 to '90. For April, the average butter value of that milk in these four years was 3.98 per hundred pounds. That is, it contained three pounds and ninety-eight one hundredths of butter fat for every hundred pounds for four years, from '87 to '90. We began in April, 1891, to apportion the dividends on this Babcock test and the per cent of butter fat jumped up to 4.41. Mind, it had averaged for the four years previous, only 3.98. The average for

May of the four years previous was 3.82; of May, '91, 4.07. The average for June for the four years was 3.77; for June, '91, it was 4.12. For July the four years averaged 3.94; for July, '91, 4.22. The average for August the four years previous was 4.19. For August '91, 4.43. For September, 4.36 for the four years. in September, '91, it was 4.59. For October, the average for four years was 4.62. For October 1891, it was 4.91.

Now my friends I will give you the average gain in these months in the value of that milk, under this new system. The gain in April was .43; nearly half a pound of butter. The gain in May was .25; in June .35; for July .28; August .24; September .23; in October .29.

The average monthly gain of 1891 over the four years preceding, was 29 4-7 or nearly one-third of a pound of butter to every hundred pounds of milk.

Now what caused that gain? Not altogether an increase of honesty. It *was* more conscience in the treatment of the cow; less skimming for company and coffee; a more thorough adjustment of rectitude all along the lines, which would affect the value of that milk. You talk about cotton seed and linseed meal; I don't think I ever saw anything that will affect the yield of cows like the Babcock test.

These men are now all on the road to improvement; they are commencing to study the problem of good housing and good care more than ever before; because, mind you, every man's sins are on his own shoulders. Some people have a great horror of sin; but sin is a tremendous educator.

We paid for October $1.28 per hundred pounds of milk and returned the skim milk. The highest average in any of the creameries in the county, was $1.17. There was a difference of eleven cents between our average and the average of the creameries about us.

What was the reason of that?

The reason is, we had credit for all the fat the cows gave; and they had credit for what they could get, and there was a difference of eleven cents in a hundred pounds in our favor. There has probably been some skill exercised in selling that has helped; but not enough to make all that difference.

Now these men are saying, "We want this way of doing things." Honesty has proved to be the best policy; *we* want to be honest now, tremendously. Human nature is weak; none of us can put on any airs; the best of us are liable to tumble; but this much we always should do, and that is, do business according to an honest system. The *system* may hold us up when we could not hold ourselves up. This system is rapidly supplanting every other system because of the advantage of honesty.

Another late improvement in creamery work is in the treatment of the skim milk; and when adopted, it goes to the patron in a more perfect condition than he can produce it himself, for feeding purposes. In July and August you know skim milk will sour in a very short time; and when it is sour, you have lost a large part of the feeding value. For instance, good milk contains thirteen pounds of solids in every hundred pounds of milk; the balance is water. Of these thirteen pounds of solids, you take out four pounds of butter fat, which leaves nine pounds of other solids. That nine pounds you have for feeding. Of that nine pounds, 4.70, sometimes nearly five pounds, is milk sugar. The moment acidity strikes it, it is gone; and those men who feed sour milk to hogs from a stinking, sour swill barrel, don't know what they are about. They are destroying five nirths of the feeding value of that skim milk by allowing it to sour.

Now our patrons want to keep this milk sweet; they have a large quantity of it and they want to carry it over a day or two. By the aid of the steam jet pump, we can take the skim milk and run into a vat where it is scalded to 160 degrees; and the milk scalded to that temperature will keep sweet two days in the hottest of weather. That is called sterilizing it. So every man takes home sterilized milk. We add five-ninths to the feeding value of that milk in hot weather. The ordinary farmer is careless and unthinking about this thing.

I am put here with the responsibility to see that every patron secures the largest degree of profit possible out of this business; and therefore should instruct him; talk to him; give him the advantage of all the intelligence and education I possess, so that he may know the truth and see the truth; for only the truth can make us free.

And here are lines of valuable thought. I submit these things to you, not on the supposition that you are going to do these things right away, but that you may understand how it is done.

Ques. What system do you have for running the milk down the spout into the vat to heat the milk before it is separated? Don't you warm the milk before separating, up to a certain temperature?

Ans. Yes, we run milk that comes from the patrons' cans into the receiving vat, and the milk from the receiving vat to the separator runs into a small heating vat that has a coil of small steam pipe,—or rather, is surrounded by these pipes, and the milk is heated up to eighty degrees.

Ques. What proportion of the hundred pounds carried to the factory is taken back?

Ans. We usually skim twenty per cent; but it all goes back except the butter, next day. He gets back,—we skim twenty per cent,—to-day eighty per cent, and to-morrow he takes the balance after churning.

The patron brings the milk in once a day,—every patron cares for his night's milk and in the morning, both milkings are put upon the wagon and carried to the creamery. It is delivered once a day.

The separator will take the butter fat out of sour milk even. There is no trouble in this direction. In butter making, the two milkings are put together; in cheese making they are kept separate.

We are hired men; they hire us and our machines and our ability to do this business for them; and we receive for our pay, four cents a pound.

Mr. Winslow. The operator at our factory tests the cream by small churns.

Gov. H. That is not as accurate. It averages pretty fairly but is not as accurate as the Babcock. There is some percentage of loss in the large churn; a certain amount of butter fat goes off in the buttermilk. The same difficulty in a larger degree is found in the small churns. By the addition of water and salt, there is fifteen per cent more butter than there is of butter fat; and out of the surplus the shares are divided by the same ratio as the butter fat. If a man brings four per cent milk, he gets a correspondingly increased ratio of the gain, over the man who brings three per cent milk.

The Babcock test should not show as much fat as you get butter. The divisor is a just one, for it is a divisor of all the proceeds. You have just so much money do divide at the end of thirty days and we find what the value of one proportion of butter fat is to the whole.

Ques. Do you apportion the same value from a hundred pounds of butter fat from one breed that you do to another?

Ans. It is the same. I know my Jersey friends have a conceit that Jersey butter is somewhat more sanctified of the Lord than any other; but when it goes to the creamery, I have not yet known a man who could tell what kind of cows the butter was made from, if nicely made.

Ques. What about coloring butter?

Ans. The question of coloring butter, my friends, is simply the demand of the consumer.

Men who make stockings, do not change the character of the stockings by making them white or black or red. They make them just as individuals want them. Now if you were to put butter in the market, *white*, it would knock off the price of that butter ten cents a pound.

I have never seen a christianity yet in a man, that could stand it, when he knew that all he had to do was to make the butter with a harmless coloring compound to suit the demand of the consumer.

We do not change the butter; we only suit the taste of the consumer. It is a matter of taste entirely.

Ques. Will this separator take out more cream from your milk than you can get from setting by the cold or ice system,—the Cooley system?

Ans. Yes, there is no system known on earth or under Heaven that can extract the butter fat out of milk as thoroughly as the centrifugal separator.

Ques. What was the result at Kennebunk of testing skim milk from the Cooley setting, that they reported only a trace of butter fat?

Z. A. GILBERT. I will say that samples of skim milk taken at the Kennebunk Institute held a short time ago—two of the samples—one showed merely a trace of fat, and the other, not sufficient to figure up a percentage. These were samples from the every day work of certain patrons of the factory at Kennebunk. However, it may not be certain that every case would correspond with that. We have found cases that did not. The lecturer would tell you that that depends upon the condition of the cow, together with the perfection of the work.

Gov. H. Take this as a gauge in your mind; when a cow is two months in lactation, any system of deep setting, whereby the cold is brought down to forty-five degrees, will extract the butter fat from the milk quite thoroughly; but just in proportion as her time extends in lactation does the process of deep or open setting lose more and more fat in her milk, until when she is six months in milk, as a rule it loses sometimes nearly one per cent of butter fat. If she gave four per cent, there was one pound in every hundred pounds of milk; or twenty-five per cent loss.

Here is a report from C. P. Goddard at the Farm Institute, St. Croix, Wis., where tests were made.

One cow tested 6.8, and another 6.2. The loss was three-fourths of one per cent. Some skim milk set twenty-four hours in ice water tested eight-tenths of one per cent. You see that would be a loss of eight pounds of butter in every thousand pounds of milk. Some skim milk from the baby separator showed one-tenth of one per cent. That one fact shows the difference.

Prof. Robertson says he cannot escape the loss of three-fourths of one per cent of the butter fat, except by the separator, when cows are six months along in milk. As the cow becomes a stripper, the milk gets richer in per cent of fat but poorer in flavor. It becomes very necessary then that we adjust oursêlves, in both knowledge and practice to these lately discovered facts, to save loss. I am not speaking for this machine or any other machine, but for the central facts.

When a man said to his wife, "Facts are stubborn things;" the wife replied, "What a tremendous fact *you* must be." Just so with the fact of cream separation.

Ques. Do you put water in the churn after churning, before drawing off the buttermilk?

Ans. Our process is,—our cream is ripened to our best judgment; slightly acid; ripened so that the operator can determine whether it is at the best churning stage.

Then the churn is set going at the right temperature. If the cream is from stripper milk, up goes the temperature. Many people among you who feed cotton seed meal, know that they must churn cream at a higher temperature on that account. Down South where they feed large quantities of cotton seed meal, they churn at seventy degrees. If you feed cotton seed, you must run the temperature to sixty-five or seventy, or you will waste a lot of butter in the buttermilk. We handle the temperature question according to the condition of the cream. As cows run towards the stripper season, the temperature is increased. When the butter breaks into little granules about the size of yellow mustard seed, the churn is stopped at once. The butter then is in a condition of divisibility. If we take it at that time we can get the caseine out of it at the least expense to the butter. So we stop and dash in cold water; that will chill these little globules; and if they don't rise well and separate nicely, about three or four handfuls of salt in a pail of water is added. That is a very heavy medium and forces all the butter fat to the top. Then we turn in water and wash that butter just as thoroughly as possible, until the water runs absolutely free from milk color; wash out all the buttermilk, instead of putting it upon the worker and working it out.

What makes butter go to decay. is the presence of caseine in it. It is the cheesey matter that causes it. All frowey butter has a cheesey flavor. You want to get that caseine out of it and you can wash it out when it is in that fine, granular state; but if you pound that butter together you cannot wash it. My mother used to say, "keep churning until it gathers;" and as a result I got a lot of buttermilk into the butter and mother had to work it out; our mothers had to work out a good many things. You see the philosophy of this.

The question is asked, why does stripper cream churn more slowly and difficult than cream from cows fresh in milk? It not only churns more slowly, but creams more slowly and stubbornly. The separation of the butter fat from the caseine is also more difficult than from cows that are fresh. When the cow comes in fresh, the butter globules are larger. When she has been in milk six months, the number of butter globules is nearly double; and they are correspondingly smaller. If she had three thousand globules to an inch space when six months in milk, there was about fifteen hundred when she was fresh. Now then, the size of these globules affects their buoyancy to rise in the milk serum, because the square of their resistance is increased as the size of the globules is decreased. To illustrate: we will suppose them to be bubbles of air. You take a tumbler of water and you will see in a hot day, the fine air bubbles clinging to the inside of the tumbler. You could not make a good sized bubble cling there, it would come to the top. So when the fat globules come to be small, they are hard to get up through the serum. Then again, a stripper's milk is more viscous. If an old lady wants to cement a broken jar, she will boil it in milk from a farrow cow. It is more viscous or sticky. All these things show the action of that viscosity that hinders the separation of butter fat globules in churning; also hinders the rising of them in creaming.

We have to ripen the cream of strippers more to cut apart this caseinous viscosity with lactic acid.

Ques. Does washing butter have a tendency to bleach it?

Ans. It may, I am not prepared to say from experience. The Guernsey cows put so much color in butter that you do not need any coloring; but nobody brings all Guernsey milk to the creamery.

Lumps of undissolved salt will take the color out of cheese. When you salt cheese, if there are lumps of salt undissolved, you will see a place around that salt that is white. We sometimes injure the color of butter by excessive salting, by putting in more salt than will dissolve. That takes out the color and makes the butter streaked.

Ques. How large a range is there in the percentage of cream between different herds; between the cream of each?

Ans. I have seen as high as forty-four per cent difference in value. I have seen an inch of cream by the system of deep setting, that showed forty-four per cent less butter value than another inch of cream. It is quite frequent to find fifteen, twenty or thirty per cent difference in value. The Cooley people claim that when cream is raised under the space system, that it will all churn at equal value. I do not believe it, because I know an inch of cream varies in value and a space is but a fraction of an inch.

Ques. Is the machine known as the butter extractor, correct?

Ans. Yes. I will say that in combined butter and cheese making you can make a perfect use of the extractor. The gentleman asks if the butter extractor is practicable. We ran one in our creamery—the first one that was in the West. It was not the present, improved style and was imperfect, so we took it out. I think we shall put one in, in the course of the year, into a combined butter and cheese factory, when the best economy of it is found.

In Wisconsin, we have a law which provides for the making of what is called standard cheese. That cheese must contain thirty per cent of fat. We have milk that comes to us, of four, five and six per cent of fat. We cannot get pay for it in cheese making. That fat is worth twenty-five cents a pound;—if we put it into cheese we get ten cents. We must adjust these values for the patron. To illustrate take my associate editor's factory which is run with the extractor. He takes in, say, ten thousand pounds of milk a day. When the milk is all in, he agitates this milk thoroughly, then has a pipe that runs from the top of the milk to the bottom and takes a section of milk to the whole depth; so he has a complete sample of the milk from the top to the bottom. He turns that into a jar and agitates that and takes a Babcock test and determines how much butter fat is in that milk. We will suppose there is four and four-tenths butter fat in that vat of milk. He wants to make cheese that is thirty per cent butter fat. He wants to save the extra pound of fat. To do this, he subtracts from that milk twenty-five hundred pounds. That is one-fourth of the whole; draws off twenty-five hundred pounds and runs it through the extractor and takes out a hundred pounds of butter, and runs the sweet skim milk and buttermilk back into the original vat and makes it up with the whole milk into cheese with thirty per cent of fat. This brand of cheese has sold this past summer within three-eighths of a cent, of the best cream cheese and he had a hundred pounds of butter left which was worth $28 or $30. You will see how the extractor and Babcock test made this possible. There is where the extractor is at its best.

Ques. Why is it better than the separator?

Ans. Because he would lose the buttermilk. It would have to wait to be soured. But with the extractor there is no sourness; the buttermilk is just as sweet as the skim milk in the hour it is being separated. If he waited twenty-four hours, he would lose all the buttermilk to go into cheese, amounting to about four hundred pounds.

THURSDAY AFTERNOON.

Meeting called to order by the President, at 1.30.

Hon. Warren H. Vinton offered the following resolution, which was unanimously adopted:

Whereas the facility of transportation has brought an indispensable element of success into our agricultural operations, therefore

Resolved, That the Board of Agriculture regards with lively interest the present measures to further extend railroad facilities to our young and rising county of Aroostook; hereby commending said railroad, as a matter of common interest to all the people of this State.

HOME GROWN PRODUCT FOR THE DAIRY COWS,

By Prof. I. O. WINSLOW, St. Albans.

Ladies and Gentlemen: I do not profess to be able to *lecture*; what I have to give you is simple *talk*.

As a small boy upon the farm of my father and grandfather, I was brought up upon the basis of home production. The bread which I ate was from the wheat raised upon the farm and ground in my grandfather's grist mill. My jacket, pants and socks were of wool from the backs of my grandfather's sheep, cleansed, carded, spun and woven by the diligent hands of my grandmother.

The towel for my face, my shirt and the table cloth were from the linen produced from the flax raised upon the farm, broken and hatchelled and spun and woven also by my grandmother. My boots were of the hide of my grandfather's old cow; tanned in my grandfather's tannery, and made into boots in the end of the shed by my grandfather or grandmother, who was equally adapted to the art. So I stand before you, a living example of home grown products, and cannot be blamed if I believe upon general principles in home products for the dairy cows. It used to be a theory among farmers that they ought to raise all that they consumed. Times have changed greatly in the past twenty or thirty years.

Now, an observer might almost say that the theory is, that we ought to sell all that we produce and buy all that we need to consume. There are arguments on both sides. Of course there is a great deal of truth in the theory that it is wise for farmers to devote themselves to specialties; producing those crops for which they and their farms are especially adapted. That theory is quite a beautiful one, but I think there is danger of pushing it to the extreme. I do not think it is a safe guide for the farmer always to raise that particular crop, and only that which he things is the most profitable to him; or keep only the one kind of stock which is most profitable to him and buy whatever else he needs. There is some force in the idea that the farmer is benefited by diversity of occupation and pursuit. I have thought that the strongest argument from a political standpoint which protectionists can claim, is, that thereby a diversity of occupation and industry is encouraged.

The United States is an agricultural country—that is the way the argument runs. If the United States is especially adapted to agricultural productions; let the United States devote herself to that, and let other people do the manufacturing. The argument I refer to is, that by encouraging manufacturing, bringing into existence manufacturing villages, you afford markets, you afford the opportunities which come from large villages; which is the strongest point, an opportunity for those of a variety of tastes to find any occupation they desire to pursue. One man likes one occupation, another, another. There is a great variety, a great diversity. The tendency in human nature, by virtue of the great variety of opportunities for him, the natural inclination, is to build up the body politic.

I think this same principle taken from the political field is applicable to the farmer himself. I believe the farmer gets along better, is a better farmer, a better citizen, a better man, if he has put a certain amount of variety of diversity of industry in different lines of farming. If he can keep different kinds of stock; produce different kinds of crops; different kinds of farm stock. This is the diversity of which I speak. The dairy cow will consume a greater variety of farm crops than any animal. Sheep require one particular kind of pasture; a certain kind of feed. So with your horses; there is a certain kind of hay, best for the horse. Horse breeders must have timothy hay, oats and corn; perhaps they have other kinds of feed. The dairy cow approaches nearest to the omnivorous animal; she will eat almost anything, from bone to hemlock boughs.

Now I suppose that to get at this matter practically, we shall have to go over a long, detailed list of home grown products which are valuable for the dairy.

The first is the hay crop. It would be heresy for a Maine farmer to say anything against the hay crop to a Maine audience, because it is supposed to be a great hay State. I have nothing to say against the hay crop, but I believe as a general rule we pay too much attention to hay, as feed for dairy cows. I do not think that hay, generally speaking, alone, is a sufficient or proper diet for dairy cows.

In the second place I do not think it is an economical diet exclusively. Now I don't know whether this is a scientific audience or whether you will smile at scientific reasoning and figures; but you are familiar with the theory, that for a dairy cow you have a certain balanced ration of feed of albuminoids and hydrates; because the theory is that the dairy cow should have these two kinds of feed; about the proportion of one pound of albuminoids to five or six pounds of carbo-hydrates. Any other ration is not quite right for the dairy cow. Common hay does not contain the elements of food in that proportion; what is theoretically supposed to be the proper proportion for dairy cows. That is to say, the ordinary English hay, including timothy hay, is not a balanced ration for cows. You must put something with the hay in order to get it to show that increase.

Now the first point is, it is not a proper feed, exclusively. The second point is, it is not economical. What does it cost to raise a ton of hay?

I asked a man in Androscoggin county what it costs to raise a ton of hay. He said, he thought about $1.50; and his neighbor agreed with him, that it cost $1.50. He said you could take the horses and mow so much in half a day and you could get in about so much the other half, and it would cost about $1.50. That I think, is the great difficulty; they reason in that way, reckoning only one item of expense.

What does it cost to raise a ton of hay? It costs, upon an average, about $3 to harvest a ton of hay. Some tons may be harvested for $1.50; but taking the average weather into account; the average field;—some are smooth, some are not;—how would $3 be for the average cost of harvesting a ton of hay?

Now what are the other items of cost besides the harvesting? What does it cost for the plant food; for the fertilizer which the ton of hay has taken from the soil and which must be supplied to the soil to produce a ton of hay, which if not supplied leaves the farm so much less valuable? Suppose I call it $4. Now the books say that a ton of average hay contains $6 or $7 worth of plant food. That must come from the soil,—of course the hay gets something from the air that doesn't cost anything,—but the expensive, valuable part that costs something to replace, must come from the soil. If it comes from the soil, it subtracts so much from the soil; and you must add, before or after the crop or lose your farm. The books say, which are based upon chemical analysis, that a ton of average hay will contain in round numbers, from $6 to $7; some kinds of hay higher than that, of plant food. There is certainly a great amount of plant food which comes from the soil *naturally*. The soil contains a great amount of plant food; the difficulty is, the plant can get but little year by year. That is nature's resource; only a little is received or available year by year.

If we suppose that the ton of hay gets $2 worth of *natural* fertility from the soil, we will call the other $4. The items of cost, $3 for harvesting and $4 for plant food for a ton. That is $7. What other items? Interest on the investment; interest on the value of the land; interest and taxes. How would $1 do for that? That makes $8. What else is there? Does it cost anything for storage? Does it cost anything to build barns to keep hay in? You must have barns to hold your hay. How would $1 be for that? That makes $9. It costs $9, at least, to produce a ton of hay; and when you sell a ton of hay for $9, you sell at cost generally speaking. Of course there is some difference; but for average hay, the man who sells a ton for $9 sells at cost; it cost that to produce it.

Now what will it cost to feed a dairy cow upon hay, corn meal, wheat middlings and perhaps a little cotton seed? What does it cost for a dairy cow, fed liberally, per day? About twenty cents. From twenty to twenty-three or twenty-five cents; cows that are well fed. How much does it cost to feed a cow per day upon hay, corn meal and middlings, the hay raised upon the farm, the grain ration purchased, as is quite often the case. I think from twenty to twenty-five cents a day. Twenty cents would do, but farmers ought to feed liberally; feed twenty-five cents. That is the basis upon which I wish to attach something I am going to say now. Now that may be called an old, common way to feed dairy cows. It is quite expensive and I shall call your attention especially to more economical methods of managing the dairy, of providing feed. To begin with, I think farmers should raise more clover. Clover is hay, called that, not properly perhaps, but the name does not matter. There are two or three reasons why I believe in clover. One is, that it is a balanced ration for dairy cows; just about a balanced ration. By analysis, clover shows albuminoids and carbo-hydrates in about the right proportion, which is about one to five and a half. It is a typical feed as far as it can be made to go. I don't believe we can get along very well and feed clover alone, because of the bulk; it is too bulky.

Clover will do well enough for young stock, or cows not giving milk, or steers; it will do nicely without anything else; but in pushing a dairy cow to give a large quantity of milk and butter, her digestive system is not able to digest a sufficiently large quantity of clover to meet the wants of the system; so we must add concentrated feed to supplement that want. Another reason for raising clover is because it is economical to raise. Perhaps it costs as much to raise clover as other kinds of hay; but the point is, it don't cost as much for the fertility. Clover does not take so much of the fertility from the soil as other kinds of hay. It has been pretty well established by scientific men within a few years, that clover and other such crops, obtain a part of their nitrogen, from the free nitrogen of the air. It is no matter how a part of the nitrogen which clover contains, comes from the air; it costs us nothing. Another point is that the clover root runs deep into the soil and is able to extract more plant food from the soil than other kinds of hay and other crops. So I believe in raising clover as far as practicable; but I am drifting towards the corn crop. I believe in corn. I don't want to say too much about corn, because another gentleman is to speak about that.

I believe in corn. If there is an emblem more appropriate for the symbol of the nation than a stalk of corn, with its floating leaves, its golden ear, I do not know what it is. I believe I should have thought of corn as the typical crop, if Whittier had not made it the subject of song. "Corn is king."

It costs, to raise an acre of corn which I have in mind, about $30. That acre will produce about twelve tons of good, well ripened corn, including the ears. It does not matter what becomes of that corn; what method is taken to cure and preserve it, not particularly. The plant food is in it whether dried and kept under cover until fed, or put into the silo green; but on account of the extreme difficulty, will nigh impossibility, of preserving and caring for a large quantity of corn and keeping it in perfect condition in any other way, my own method has been to put it in the silo. I know it is safe, whether I want it this winter or next winter.

I get about twelve tons of nice, well matured corn stalks and ears from an acre, that costs $30. The cost of that would be how much per ton? $2.50 per ton for ensilage; Northern corn ensilage, that is not Southern or Western corn, or planted so thickly that the ears cannot mature, but planted as you would plant to raise a good crop of ears. Now ensilage is good feed for dairy cows.

It has been a mooted question for a long time whether ensilage has real worth for feeding dairy cows, more than its normal value. We can say, a ton of ensilage contains so many pounds of this or that. They will also analyze a certain amount of corn stalks and say a given quantity contains so much of that and so many of that; but the question is whether the same number of pounds of animal food contained in the ensilage is worth any more than the same number of pounds of the dry corn stalks, or dry hay? That is an open question; but I think quite a good many who have been opposed to ensilage have been inclined to change their opinions in the past few years. I think quite a good many have been inclined to fall in with the idea that there is some value in the palatability of food. The cattle will eat ensilage when they won't eat dry corn stalks; and the practical testimony of a large majority of farmers who have had silos and ensilage is, that their ensilage is worth more than corn fodder would be for feed. The majority of testimony is, that cows will give a little more milk, eat the food with a better relish, and that you get more butter. This is the general idea; more generally believed now than formerly. Ensilage is nice feed for cows. That is a well established point. But ensilage is not a balanced ration. I mean that the ensilage does not contain a sufficiently large amount of albuminoids, in proportion to the carbo-hydrates. It ought to be, as one to five or six; where it is now from eight to nine.

To feed cows properly, scientifically, we must supplement the ensilage or corn stalks with more concentrated feed. Now is there any other crop which we may raise to supply the lack of these albuminoids, of this nitrogenous part, to feed with the ensilage? I have spoken of clover, but that contains no excess. There is another crop and that is *peas*, which I have in mind. I believe in peas; I believe in clover. Peas belong to the same family. Peas are a nitrogen crop; they get nitrogen from the air. You will pardon me for presenting personal experience; but I am more familiar with my own experience. For the past season I raised quite a quantity of Canada peas at a cost of forty cents per bushel;—sowing the peas in connection with oats,—a variety of oats that have a stiff straw. I think the name of the oats is White Scottish. I have sown that kind of oats because the stiffness of the straw will hold up the pea vines. When they grow rank they will fall upon the ground and are liable to rot. Figuring out the whole thing, I find the peas cost forty cents a bushel. By analysis of the food value contained in the peas, they would be worth more nearly $1 a bushel, than forty cents. The ratio in peas,—one to three,—gives us albuminous food raised upon the farm to supplement corn ensilage or common hay.

We figured out a short time ago that it would cost twenty or twenty-five cents each to feed cows on concentrated feed. Now as a substitute ration, let us take 40 pounds of ensilage, five pounds of clover hay and perhaps six pounds of pea meal. Possibly the cows may not like pea meal alone; you might throw it upon the ensilage.

For the forty pounds of home grown products,—what do they cost? If you buy them, they cost what you have to pay. It is possible to raise all these upon the farm. Ensilage costs $2.50 per ton, making the ensilage cost five cents. Forty pounds would be a fiftieth part of a ton; that is five cents. Five pounds of clover hay, 2½ cents; six pounds of pea meal at forty cents a bushel, would be four cents. That would make twelve cents per day. That would be a good ration, a good ration for a dairy cow.

Now mind you, I do not mean to say I would always feed a dairy cow just this ration. I believe in variety; in gratifying the appetite. I am figuring out a possible ration raised on the farm. Twelve cents a day;—quite a difference between twelve and twenty cents a day. There is economy in the home grown product. There is the line which the dairyman should follow in order to get the greatest profit out of his dairy.

There is one other branch of the subject which I will allude to, and that is the pasture.

Pasture grass is a home grown product. I believe in pastures as a feeding ground, but not as a starvation pen. I believe that the greatest mistake, I will say, the *greatest* mistake that the farmers of Maine are making, is in depending upon their pastures to furnish feed for their cows during the entire summer. It is an old notion, that as soon as a cow gets out to grass it is all right until the snow drives her to the barn. There is a period of two or two and a half months, from the latter part of May to the early part of August when the pastures are yielding a fair amount of feed for a cow; not always quite sufficient, but sufficient to prevent the process of starvation. Earlier and later than that it is impossible. There is no pasture which in the month of May, until the latter part of May can furnish a cow with sufficient food; and the farmer who turns his cows to pasture after the early part of August, I mean, *ordinary* pasture, and expects them to get their living during the remainder of the season, subjects them to a process of partial starvation at the expense of profit. The theory comes in here, that it takes a certain amount of feed to keep a cow alive and whatever can be digested in excess of that, is profit, because it produces milk or flesh. You afford a cow just enough to keep her alive and there is no profit.

We must not depend upon pastures as we have been accustomed to. There are two and a half months, when pastures are quite valuable; but they are really worth but little at any other time; yet it costs from $5 to $6 to hire a cow pastured; that is a low figure, but I think it is just about what it is worth. There are other elements to be taken into consideration besides the fact that the cow eats grass. When you keep the cow in the barn and keep her on cultivated products, you save the fertility. That is one point. Another point is, that when a cow is ranging around the pasture she is expending energy that is wasted. The cow doesn't need much exercise.

Every step a cow takes after taking the little exercise which is healthful, is simply a waste of energy. When she spends her time hunting for something to eat, it is an enormous waste. That is the second point. The third point is, that a cow kept in the barn or fed from the barn during the summer months when the pasture is not yielding sufficient grass, produces more milk and butter than if running in the ordinary pasture. There are three or four items which summed up, lead us to this conclusion, that our pastures are not so very valuable. It is proper and right to use our pastures as far as we have them; of course it is more economical to turn stock out to feed the rough pastures than to try to mow or cultivate them; but at the same time, we must not attach too much value to them. If pastured, we ought to supplement the pasture by other feed and not be so afraid of feeding cows when out at grass. I believe a dollar's worth of ensilage or other feed, fed in summer will return as much as in winter; because the weather is warmer. The practical conclusion to which we are led, is this, no farmer's herd of cows should be limited by the size of his pasture. The profit of the dairy does not come from the pastures; that is only a small part, that furnishes sufficient food to last the cow a fractional part of the year; if the dairy is profitable, it is profitable to feed the dairy from cultivated crops; and as much in summer as in winter.

You say, cows have not an appetite for dry feed in summer. There is truth in that. If cows have been in the barn and ate it all winter, they want something green; but cows fed upon succulent food like ensilage during the winter will enjoy ensilage just as well after eating grass as before, if fed properly. Of course there are crops which we can raise, as oats, rye and barley; but we go back to the corn crop, in the absence of any of these, ensilage is a good crop to stand by. If you have it left over, feed it during the summer. If you have not raised enough last year, be sure you raise more this year. I will not attempt to prolong these remarks. I believe in dairying. I believe in taking the dairy, as fast as possible, upon the basis of home production.

To me, a model farm in Maine is a dairy farm, upon which cows are fed from crops raised upon the farm itself.

Ques. I wish to ask, if upon careful investigation, you wouldn't be safe to come to the conclusion that a ton of herdsgrass hay may be produced at less than $9, take farms as they run in Maine?

Ans. I do not think so, but there is a difference of opinion.

Mr. Vinton. I think I can raise good hay at a less figure than that. There are men who put in the barn fifty tons of hay. May it not be safe to say that that hay, taking everything that makes up cost, may be put in at a less figure than $450?

Mr. W. I want to lay a little more stress upon a point which we overlook, the value of the plant food. It is too much the custom among farmers to charge to the cultivated crops, the manure put upon the land. We haul out forty loads and put it upon the ground to raise corn. You say it costs that much to raise that crop. Your acre of corn may not have taken more than $15, a good, fair crop of corn only takes out $13 to $15 worth of plant food and there remains $45 for the future crops. That goes to the hay.

Ques. What kind of corn would you plant for ensilage?

Ans. That depends upon the climate and the soil, answering in general terms. Corn that may be safely depended upon to mature in the season. It ought to be planted in such a way that it may be matured. I do not think there is much difference between the yellow and sweet corn. In the neighborhood of canning factories it may be profitable to raise sweet corn to sell and put the stalks in the silo.

I should think there would not be much difference between the yellow and sweet corn.

Mr. VINTON. It is hard to make farmers believe that there is no necessity of the cows going out of the barn. It is new and strange to keep cows always in the barn. My cows, if they are standing in the barn to-day, haven't been out to any amount, only once or twice in a year. In two weeks they will have been there two years steady.

Ques. You don't mean to say that you keep them in the barn in summer?

Ans. Certainly. Every one thinks they must go out in summer. I don't pay any $6 a year for pasturing cows.

Hon. W. H. Vinton offered the following resolutions which were unanimously adopted.

Resolved, That the thanks of the association are due and are hereby tendered to the city of Auburn for the use of this hall for the meetings.

Also, to the Maine Central Railroad for reduced fare.

Also to the gentlemanly proprietors of the Elm House for reduced rates.

Also to the reporters and the press, for gratuitous publication of our proceedings.

SECRETARY B. WALKER McKEEN.

Ladies and Gentlemen: I believe the business of the meeting is nearly concluded and possibly a few words from me may not be amiss. It seems a little singular, a little unfortunate that the first meeting to be held after the change of the executive officer of the Board, should be a meeting which should tend to draw out so much of interest and from which you should have a right to expect so much benefit.

I came to the meeting with great misgivings; but it is gratifying to meet with a community having the interest which has been shown by the citizens in this vicinity, and the adjoining towns, making it so much of a success as it has been. Commencing under the most unfavorable auspices, a bad storm, drifted roads,—it seems to me that we have closed a very successful meeting. We have had speakers who have given us advanced thoughts. Their labors are over; they will return to their homes; but their words they leave with us. Now our duty begins. Let us take these thoughts with us to our homes in different sections of the State and put them in practice; otherwise all the effort and expense of this meeting will go as nothing; it will be entirely useless. Our duty begins; let us take it up manfully and proceed intelligently, honestly forward in the grand march towards agricultural success.

Let us not be discouraged if we are not able at once to reach the height that has been pictured by some of the gentlemen. The longest journey is traversed, the highest mountain is climbed only by short, successive steps, up, up, forever forward. Having put our hands to the plow we must never look backward. Let us keep pace with the advanced thought of the day and think of and put in practice as fast as possible the lessons we have received. If we have not the animals we wish for, let us not be discouraged, but work gradually up to our ideal standard. Let us have an ideal of perfection in the animals we wish to have around us. Having an ideal of perfection, though we may never reach it, it is better to aim higher than we reach, than fail through discouragement. It does seem to me, that there are many valuable lessons to learn from the speakers we have listened to. Some of the most valuable are contained in the instructions with regard to raising our own grain product for our cows and other stock.

When I was young, in my vicinity, a large quantity of oats and corn were raised, and the market was from the town, outward. There was a constant demand for the products of the farm, oats, hay and grain. Now, teams loaded with grain, go the other way. Instead of from the farm, it is towards the farm.

I consider it one of the dangerous signs of the times and we should avoid it, and the quicker we can turn the tracks of those teams, the quicker will come success. I was very much pleased with the remarks of Mr. Winslow in regard to the idea that we should sell everything from the farm and buy everything we need. That has been carried to an extreme in many cases. While I believe in specialties in concentrating our minds and efforts to some special work, I believe in home products for home uses.

The discussions in these meetings as they have been, and as I trust they will be conducted, will tend to draw out ideas which shall help and encourage us in home production.

The State of Maine is favorably situated. Our broad, expansive territory and variety of soil enable us to raise anything; wheat, oats, corn, peas, potatoes and roots of all kinds, so that if we are not successful in growing one crop, let us try another. My farm is a clayey loam; a soil on which corn does not grow; but I can grow excellent grass, oats and peas on it. It seems to me *there* is the key to the success of the farmer; to grow the grain that will grow successfully and cheaply, that we can produce more than we use.

I wish to throw out a thought which was presented to me by the member of the Board of Cumberland county. If you are looking at conclusions as presented by the Department of Agriculture for ten years, you will see that the usual hay crop throughout the United

States is higher than the cash value of the whole crop of cereals. When we consider the less expense of an acre of hay,—the growing and handling of it,—and that the average value of that hay, the country through is more than average the value of the cereals that require constant care, we recognize the importance attaching to the hay crop. Such is the case and I say this much as encouragement to those who grow hay,—not that I would discourage the growing of corn; it is the king of crops,—but the growing of hay can be pursued to a far greater extent than it is to-day, to great advantage to all of us.

I feel, ladies and gentlemen, that the thanks of the Board, as well as of the member of this county, are due to this city for its hospitality; they are due to the mayor for the honor of his presence, and the kindness of his remarks at the opening of the meeting. I shall go away from the meeting fully impressed that it has been a benefit to me and I trust that the lessons given here will be taken to your homes and made a benefit to you in your after life.

REPORT OF THE PROCEEDINGS OF THE DAIRYMEN'S MEETING

HELD AT DAIRY HALL, MAINE STATE COLLEGE, ORONO, November 13 and 14, 1891.

FRIDAY FORENOON.

HON. Z. A. GILBERT.

Mr. President, Ladies and Gentlemen:

I am exceedingly pleased to see so many present this morning at this early hour on an occasion of the kind for which we are assembled. In some respects this meeting is a novel one; it is somewhat experimental and calls for an explanation on our part. In the first place, education has come to take a wider scope than we have heretofore attached to the term. All the way along we have been associating that idea of education with the matter of book knowledge and the securing of book knowledge for the purpose of knowing more of books, literature and science; never carrying with it the idea of a practical application. But as our knowledge of education has expanded, as our wants have been made apparent, we have come to the advanced idea that education may be rightfully applied to production as well as to the gaining of knowledge. Hence institutions are being established and fitted for the purpose of giving a knowledge of the best methods and practices in production; and we are assembled here to-day to illustrate a measure of what is being done in this special direction of dairying. A dairy school is certainly a novel idea; we have never before had an assembly of the kind brought together for the purpose that we are assembled here to-day.

Neither have we ever had facilities for assembling in a building adapted to educational dairying. This is an advanced step in public education; we have facilities of carrying it on and this meeting is intended to draw the attention of the public to them, as well as to illustrate the methods and practice now in vogue in carrying on the work. We ask your careful attention in this work, and trust that it will prove of interest to you. Of course there can be but a measure of work carried on in the brief time of to-day and to-morrow, but by calling your attention to these facilities, methods and practices we hope it may lead to a great deal more work than we shall be able to accomplish here and now.

WHAT CONSTITUTES GOOD BUTTER.

By G. M. GOWELL, State College, Orono.

Whenever we visit the butter markets we find collections of many grades and qualities of that fatty substance and when we continue our investigations further and endeavor to trace out the history of these varying consignments by visiting the creameries, examining the processes there in vogue, and becoming acquainted with the farmers, their stock and its handling, we are led to conclude that the wide differences in quality, from the best to the poorest, is due to a lack of conformity to certain conditions and essentials that are known and recognized rather than the necessity for the discovery of other processes, methods or apparatus.

The food and energy represented in the composition of a pound of good or a pound of poor butter are practically the same.

Whether the article is of the highest excellence, waxy, nutty, aromatic, sweet, and pure, or greasy, white and rancid, the food cost does not materially differ, and then not necessarily in favor of the poorer sample.

More than this the labor required in caring for herds of cows specially adapted to a high quality of butter, and in the manufacture of their milk into the choicest article is not materially greater than that demanded in the handling of indifferent animals and in securing from their milk the defective low priced butter. The poorer butter in point of food, cost and labor is not more cheaply produced. The substituting of methods and exactness for indifference and carelessness is economy of labor.

It may seem to those who are familiar with dairy literature almost superfluous that so much of the time of farmers' meetings is devoted to dairy matters. True, in no line of agricultural progress has greater proficiency been attained by a limited number of workers than in the production of butter of high quality but the fact remains that the larger part of the total output is far from what it can be made to be with the reasonable application of thought and skill.

I place before you this chart the more plainly to convey to you the relationship of the various points of quality as they exist in perfect butter, the whole to be divided as follows:

Positive Qualities of Butter.

Flavor—Agreeable, nutty, sweet and pure	40
Make—Working and making..........................	20
Solidity—Stiffness, not easily melting....	12
Texture—Closeness of grain, breaking with a distinct fracture like cast iron.....	12
Color—Natural, neither too high, nor too low.	8
Moisture—Not excessive.........	8
	100

Negative Qualities of Butter.

Flavor—Strong, cheesy, bitter, insiped, too salt, too fresh.

Make—Uncleanliness, uneven working and salting, mussy handling or moulding.

Solidity—Softness of body, unable to stand firm, easily melting.

Texture—Openness of grain, salvy, sticking to knife in cutting, not breaking with distinct fracture.

Color—Excessively deep or pale, appearing artificial.

Moisture—When cutting the water following the knife freely, or when broken, the water oozing from interstices.

Every person interested in this subject should endeavor to become familiar with butter of the highest quality, so as to carry in their minds constantly the ideal of perfection, and not when examining a collection of samples lose sight of that ideal and adopt as their standard of excellence the best sample of the collection before them.

While quality depends very much upon the handling and treatment of the milk and cream, the cow herself is the vital factor that determines more than all others combined the character of the product.

As an object lesson upon this subject I have prepared some samples here under precisely similar conditions from the milk of four of the breeds most commonly found upon the farms of our State, viz: Holstein, Ayrshire, Guernsey and Jersey. These cows were all thoroughbred, were all fed the same hay and grain ration, treated alike and the milk, cream and butter handled uniformly. The differences that exist can be ascribed only to the cows employed.

These two samples from the Holsteins and Ayrshires are very much alike, both are lacking in texture, are soft, and very light colored. These two samples from the Guernsey and Jersey are in marked contrast to those previously shown and are quite similar to each other, excepting that the Guernsey sample is of a deeper yellow color. Both are nutty and sweet in flavor, very firm and of close grain, and of an attractive color that was not secured by recourse to the artificial, oily butter color of commerce but was furnished naturally in the fat of the cow that has been bred for more than a hundred years as the prime, underlying factor in the production of perfect butter. No maker, however much skill he may possess, can secure from the milk of those Holstein and Ayrshire cows butter of a quality sufficiently light to sell at a fair price in a critical market while the butter from the Guernseys and Jerseys could have been considerably abused in its churning and handling and still come out not very badly damaged. I do not offer this as an excuse for careless handling but simply to illustrate the advantage of adaptation.

Ques. What do you mean by *nutty* as related to the flavor of butter?

Ans. A similar flavor to that of filberts or oil meal—a sweet, clean flavor.

Ques. Can you tell us so we may know when butter is worked sufficiently?

Ans. Not definitely. A knowledge of this point must come from contact with the butter. The butter having been brought in granular should be salted in the churn after washing, while yet in pellets. This secures an even, uniform, incorporation of the salt and obviates the necessity of working with the lever for this purpose. The working should be sufficient to thoroughly unite the granules and bring the mass into a waxy condition without carrying it far enough to soften it by breaking the grain and injuring the granular structure.

Ques. Do you ever get two churnings that require the same amount of working?

Ans. Very nearly. When the cream is ripened and tempered alike, the washing carefully done, the working amounts to about the same. One can tell by handling the butter with the paddles whether the working is sufficient. Leave it tough and waxy.

Ques. What do you mean by openness of grain?

Ans. Large spaces between the grains filled with water, showing as it is cut or broken open.

Ques. What is the standard for color?

Ans. The standard used to be, the color of butter made while the cows were at pasture in the month of June, but that means nothing, now from the fact that we hardly know what a common cow was when turned upon common pasture grass. The standard, is, a mild firm, clean yellow, not red or dirty brown.

Ques. Is the judgment of individual experts the standard of color or the demand of the market the standard.

Ans. The demand of the market—but experts lead the public taste sometimes.

Ques. Does not butter color have more influence in selling than would be indicated by your scale of points. In the scale you have marked only eight points for color against twenty for make or forty for flavor. Would not color have more than that influence in the sale of butter? Take those two samples of Guernsey and Ayrshire, would there not be more than eight points between those two qualities of butter?

Ans. White butter is not attractive to the eye, and is detected by the casual observer, but its importance in comparison with quality is very much less. Perfection is indicated by 40 points. If eight points were deducted leaving 32 as its credit for flavor it would be very defective indeed. Or if the twenty points indicating perfection in make were reduced by eight to 12 points as its credit for make, indicating mussy handling, and uncleanliness, it would be objectionable, I think at least equal to the perfect article with its lack of color.

Ques. I infer from your remarks that originally butter was churned until it became a solid mass, while now the churn is stopped while it is in a granulated form. In the former case the salt had to be worked into the butter, in the latter case it comes in contact with the granules. I want to know about the two methods.

Ans. By all means stop the churn while the butter is in granules the size of number eight shot. The old way was to churn until it became one solid mass. It was then taken into the tray, bowl or worker and worked and washed and dug apart and washed again until the buttermilk was all washed out. If the churning had stopped when the granules of butter were one-third the size of wheat kernels, the buttermilk drawn off, and washed with water at about 60° temperature, two or three times, or until the wash water is clear, it would have been cleaned from the buttermilk without rough handling or injury to the grain. The butter is now in the churn in little pellets and it is a very easy matter to mix evenly through it the quantity of salt required, taking care to use an additional quantity for the excess of moisture it is carrying. The difficulty from uneven salting is reduced to the minimum. The working required is what will bring it into a waxy condition and no more. Beware of over-working. Under the old process it was unavoidable.

Ques. Are you not troubled with the butter granules going into the buttermilk?

Ans. We have a strainer made with a perforated bottom the top of which is eight inches, the bottom five or six inches, and about five inches high, and use it to strain the buttermilk as it comes from the churn. If the granulation is right but little will come through.

Ques. How much do you ripen cream before churning begins?

Ans. Allow it to get slightly acid, just so you can detect it.

Ques. In ordinary dairy work the churning is done once in two or three days. That cream which was taken off first becomes scur sooner. Ought to be mixed.

Ans. The cream should be put in one receptacle as obtained, and stirred twice each day so that it may ripen evenly. Do not put any cream into the vat within twelve hours before churning as the mass would not be of uniform maturity and hence interference with clean separation might result.

Ques. Is there any difference between acid cream butter and sweet cream butter?

Ans. Sweet cream butter, if eaten when not more than ten days old, is soft, flat and of creamy taste, and lacks the character that slightly acid cream butter has. It is claimed that sweet cream butter if kept a few weeks develops the flavor of acid cream butter within itself.

Ques. Should the temperature of the cream be uniform when churned?

Ans. Yes.

Ques. We frequently find the term aroma used when describing the quality of butter. What are we to understand by the aroma of butter?

Ans. That sweet pleasant odor that comes from butter when we smell of it is commonly called aroma. The term is, however, very much abused and I don't like its use in this connection.

Ques. Is it in any way related to flavor?

Ans. There are no fine flavors in butter that has a defective aroma. If its aroma is perfect, its flavors are probably so also, but not necessarily.

Ques. I think you said in the course of your remarks that it was desirable to have the color natural. Do you think it is practicable to have it generally so?

Ans. Yes, when sufficient time has elapsed to breed our herds of cows to color quality. This of course will require several years of careful work, but it is one of the most promising features of breeding dairy stock. In the meantime it will be necessary to resort to some artificial process to get the butter to the color standard.

Ques. Is the color of butter wholly due to the cow that gives the milk?

Ans. Mostly. Different feeds color differently. Wheat bran does not color much, neither do oats or the oil meals. Corn meal and Hungarian grass as well as June pasture color highest.

Ques. Does the temperature of cream affect the color of butter.

Ans. It does. If churned at too high a temperature its lustre and brightness are injured. If too low, the churning process is prolonged and again the color suffers.

MILK PRODUCTION.

By Prof. Roberts, Professor of Agriculture, Cornell University, New York.

There are certain lines of advancement in milk production which give promise of leading to much better results than are now obtained. There are others which at the best can only give us slightly improved returns over those now received.

It is probable that we shall never find a more economical animal, for the production of milk than the cow. It is also probable that little or no advance can be made by increasing or diminishing the size of the cow. As to new breeds, none are likely to be discovered which are superior to those already possessed. If superior new breeds appear, they are almost certain to be formed out of the best animals which we now have. Neither are we likely to discover any new plants, or any new methods of feeding the cattle foods now in common use, which shall be so superior to those now practiced, as to give greatly enhanced returns. Then if we are not likely to change the animals of the dairy for another species, or materially change their size, or introduce new and improved breeds, or superior plants and methods, in what direction may we search with confident expectation that great advancement will be made?

No one will undertake to deny that we have some really superior cows; that they are so nearly the right size that little fault can be found with them; and who has the temerity to assert in a public meeting that we have any poor breeds?

Almost everything has been used and tried as cattle food, from dried fish to Texas cactus and cotton seed meal, transported thousands of miles by railway. As to methods of feeding, there has been no end of them; experiments without number have been made with all kinds of cattle foods, and we have finally found out what is best, at least in a general way. With this outlook before us it would seem at first sight that you had set me to glean in a barren field, but when one discovers that the average yield per cow, in your own State and those adjoining it, seldom reaches three thousand pounds per cow a year, or say four hundred pounds of solids, it is evident that there is still room for great improvement.

Notwithstanding this low average yield, it is no uncommon thing, in both grade and native herds, which have been well cared for, and carefully bred and selected, to find upwards of one-half of the dairy producing one thousand pounds of solids per cow a year. If four hundred pounds of milk solids per cow a year, is a liberal estimate of the amount now produced, and it can be certainly proved that quite a large number of cows in some herds, and in others all, are producing one thousand pounds of milk solids per cow a year, it is evident that just here, there is ample room for improvement.

I do not care here, nor now, to say anything about the exceptionally large yield which makes even the large one I have given look small by comparison. Few of our farmers have either the training, skill or foundation stock from which to start, or bank accounts upon which to draw, which would justify them in entering into hopeful competition with the breeders of the now quite long list of phenomenal cows. While I would not discourage aiming high, it must be admitted that there can be no reasonable hope that the multitude will ever be brought to reach the high standard already set by a few. We should learn early in life that the medium road is the safest, and that in agriculture the greatest profit is not usually found in either phenomenally large or very small productions. Notwithstanding all this, we shall find that in almost every case increased production per cow and acre, will tend greatly to diminish cost and thereby increase profits.

If the facts have been fairly stated, that the average yield of the great dairy States seldom reaches three thousand pounds of milk per cow and year, and that men of no great skill, produce from cows of plain parentage eight thousand pounds of milk, or say upwards of one thousand pounds of solids per cow and year, then it would seem clear that improvement should begin first of all with the cow.

This leads to the question, how did the good cows become good? and why do the poor cows remain poor? It might be answered briefly by saying that good dairymen have good cows and poor dairymen have poor cows; and that to improve the dairy, you must first improve the dairymen; but this answer is too general and is not quite correct, for many good dairymen have some poor cows, cows for whose board they annually draw a check to cover the deficit which arises from excess of cost over value of product. The poor dairyman almost invariably has some good cows, cows which pay their own board and a portion of that of their inferior sisters. So the questions may be asked again: why good cows are good and why poor cows remain poor? In order to make two such distinct classes, unlike forces, or forces of different energy, must have been at work. By looking carefully it is possible to discover some of the forces or factors which produced the advance or the retrograde. First, it must be distinctly understood that the cow, of her own will has no choice in this matter, that she is just as good as she could be or can be; had it been possible for her to have grown one inch taller, or to have produced one pound more butter in the year, she would have done it. Whatever she has done, is simply the average product of a multitude of factors which have not only been active during the life of the cow, but also during that of many of her ancestors. Whatever the product of the cow is, is simply the harvest of a multitude of sowings, both bad and good. How then, with all these factors at work, did one cow become good and another remain poor, for they were all poor as far as the dairy is concerned, when in a wild state.

Without repeating the question again, it may be said that the first and great factor in the improvement was improved food; the second, improved environment; for there is no possibility of pulling or pushing a breed or variety of animals higher by the ear tabs of its pedigree. Selection steps in and takes advantange of what has already been accomplished, and where mistakes have been made and no sufficient improvement secured, selection discards the undesirable animals, and thereby progress is made rapidly. After having attained a certain stage of improvement which is considered superior, then of necessity inbreeding has to be practiced, simply because if out breeding were resorted to, animals inferior to those which had been improved would have to be used and deterioration must then inevitably result. After these four factors have been used for a considerable time, we select the best of the improved animals, write out their genealogies as well as we can, call it a pedigree, publish it with others in a book and proclaim that we have a breed of pure bred or thorough-bred animals. We will not stop to criticise the many improvers of our domestic animals who in their eagerness and earnestness to hold on to what had been gained, started herd books by recording higher grades.

This last sentence is not written in any captious spirit, but in order to encourage the production of a very much larger number of breeds and varieties. The Shorthorn of Maine, should be unlike the Shorthorn of Kentucky; the dairy cow of Vermont should differ somewhat from that of the Genessee valley. We, as dairymen and breeders of live stock, do not seem to "catch on quickly," while other countries are producing from one to one and one-half dozen new breeds yearly, we are content to put up with the old breeds or purchase at long figures the new ones, although neither may be the best adapted to our local conditions.

After having traveled over most of the United States, and noted the wonderful variety of soil, climate, vegetable growth and wants of the people, I say without hesitation, that we want many more breeds of animals and almost an infinite number of varieties. In fact, it is hardly exaggerating to say that every dairyman should have a distinct variety or family of dairy cows. How is he to get it? Select from the animals already in the herd, those which come nearest meeting the ideal of the owner, the ideal being high and well considered in the beginning; this selection must not be made arbitrarily or by guess work.

The quality of milk the cow produced daily and yearly must be ascertained to an ounce; the quality of the milk must be tested by the most accurate instrument that science has brought to our aid. No man hereafter can lay claim to being a good dairyman nor an improver of dairy cows, without he owns and uses daily accurate scales, and a milk fat tester at least once a week. Neither can a man lay claim to being a good dairyman who keeps cows which are over three years old, which bring in a gross product from ten to twenty-five dollars less than the cost of their food and care. Neither can he call himself an intelligent progressive dairyman unless he owns or has access to the use of a male whose ancestors have been noted for many generations for superior qualities.

The main factors are now at hand for a beginning and from this on; the factors: food and environment, will play most important parts, as they already have done, in producing the valuable qualities which have been secured in the best herds. The *quality* of the food should first receive our most careful attention. By quality is meant two things: digestibility and aroma; and usually aroma is the best possible index of digestibility. Products which have high aroma are eaten with avidity and digested with ease. How quickly the sweet angel of digestion departs when the bread has been cut many hours before it is put on the table, or when the apples and radishes have lost that indescribable something from lying for days in the wind and sun, on the sidewalk by the corner grocery.

The object should be to get the cow to eat and digest much; she cannot do this unless the food given to her contains an abundance of aroma or volatile oils; a better name would be digestion oils, for that is the office they perform to a very large extent. Having furnished the animal with a larger amount of food of a better quality, she is enabled to eat and digest more and this having transpired, nature immediately seeks to do something with the product; if it is a young animal, growth is accelerated; if it is a mature animal, either fat and flesh, milk and butter, according to the tendency of the animal, will be developed. More milk means more development of udder, larger milk veins, increase of those parts which serve to fill and nourish the udder, and if this is carried on for some time, the organs of milk production are developed, habit becomes firmly fixed, potency is acquired so that these qualities or tendencies are likely to be transmitted to the offspring. Food, then, good food, abundant food, digestible food, is the prime mover; the alpha of improved dairy husbandry. The power which resides in this improved food, may be squandered or directed into wrong channels, or prove a great hindrance to maintaining the standard of excellence already reached, if suitable environment and skill are lacking.

What to feed, how to feed and when to feed, how to direct a given amount of energy which is contained in the food, into the exact product desired, and so that the greatest per cent possible of the energy shall be found in the milk pail or wherever else desired, are questions which demand our most careful consideration.

WHAT TO FEED. Animals that produce an excess in value over cost of food and care. How are they to be secured? Largely by ceasing to propagate animals which are unprofitable, it matters not how these animals became unprofitable, except that a study of the causes may be able to teach wisdom in the future. Animals fail to respond as liberally as desired because of lack of sufficient and suitable food, of comfort and superior inherited qualities. The lack, in most cases, of strong valuable inherited qualities, being due to too numerous fastings, or too many hours of discomfort of one or more of the cows from distinguished or plebeian ancestors. Scrub qualities come primarily from starvation and abuse, and as no nation nor no variety of cattle have ever improved without improving, first, their food, and then their environment, we will do well to lay more stress on food and comfort, and by comparison, less on paper pedigrees. True and valuable pedigrees should be simply the recorded gains made through several generations, produced by food, comfort and habit.

The scales and fat tester will not make the cows give milk; neither will they increase the amount of solids and butter fats. This statement may be thought to be superfluous, but the fact remains, that it is no uncommon thing to find dairymen using both of these instruments, and yet persisting in keeping animals in the herd which give no profit.

Having found out the amount and quality of the product of the cow, no further effort is made to find out the other factors involved in the problem of economical milk production. Having no facts at hand, as to cost of keep and care of the animals, the implements of precision are of comparatively little use. Thirty-five dollars worth of product per cow is found to have been received, but the problem of profit is not solved because it is not known whether the expenses have been twenty-five dollars or sixty-five dollars per cow one year. How may this be remedied? First by charging up to the dairy all food fed to it in the barn, a reasonable amount for pasture, for labor and for sundries. Dividing this total cost by the number of cows, the average cost per cow will appear. Cows vary so little in the amount of food consumed that for all practical purposes, this gives a fairly correct basis of calculation. Now if the scales show the quantity of product, and the fat tester its quality, it will require but a few minutes of computation to discover with a good degree of accuracy, the value of the yearly income per cow, and this compared with the average cost of maintenance of each cow will show the profit or loss, not only of the whole dairy, but of each cow which composes it.

Now if the showing is not good, not only of some individual cows, but the dairy as a whole, what should be the conclusions? First, that the feed was insufficient, or poor; second, that the cows had not inherited enough desirable qualities; third, that they had spent their energies in the labor of procuring food and in keeping warm, or that the man who had fed and milked these cows and manufactured their products, was ignorant of much that belonged to dairy husbandry.

Even if it is known, by the scales and fat tester, that certain cows in the dairy fall below the standard of profit, yet this does not necessarily prove that they are bad cows; it only indicates that under their present management they are unprofitable. All that has been learned is the amount and quality of their product; change the dairyman, increase the feed in quantity and improve its quality, and lo, what seems to be a miracle is wrought in the dairy. The three-thousand-pound cow crosses the line of unprofitableness and ranges herself among the best cows of the dairy. Then in order to know what to feed, it must not only be known what the present product of the cow is, but we must know something of the man, the hay, the grain, the stable, the churn, and last but not least, the salesman.

You now see what a wide field for thought and investigation has been opened up.

While I cannot urge too strongly the general adoption of the scales and fat tester, yet I would not urge it so strongly as to overshadow other problems of successful milk production which are of equal importance. Let me say once for all that the failure to make dairy husbandry very profitable is due in almost every case, to the dairyman's failure to bring *all* of the factors of success into active operation.

HOW TO FEED. With foods that have been kept from the air, the dirt, and foul smells. Feed so as to increase the appetite. All the forces of nature have periods of activity and of repose; the stomach of the milch cow is no exception to this general rule. Then the greatest success in feeding will come from stimulating the stomach, to a goodly extent, with foods rich in volatile oils. This food may be fed in courses, just as a grand dinner is served, or if it is properly handled there is no objection to an appetizing hash. The cow should eat to repletion and then be left alone until she has not only done the larger part of the work of digestion, but a space should also be given for the stomach to rest; this is simply saying that the cow should come to every meal with a sharp appetite and leave every meal with a full belly. If the cow has eaten and digested enough to produce from five to eight pounds of milk solids per day, she has performed a good deal of work and it will be entirely unnecessary to make her walk half a mile for her sixty pounds of ice water, in order to have her take sufficient exercise; or, if the water is in the barn and under shelter, it will not be necessary to keep a dog and a boy for promoting cow exercise in the winter, much less the summer dairy.

WHEN TO FEED. Morning and night, twice daily, twelve hours apart. While fair success may be secured by feeding oftener, yet in the long run when health, product and cost are all considered, there can be no doubt that the greatest profit is received by feeding twice a day. The cow's great, capacious stomach indicates two things; capacity for living on unconcentrated food and ability to thrive and prosper on few meals per day. Feed cn pastures when they are so poor that the cow has to labor many hours each day in order to maintain herself. Feed corn as a supplemental food to poor pastures in the summer. Feed supplemental foods when the pastures are watery and the grass is imperfectly developed in the spring. Feed early in the fall so that the animals will not fall away too rapidly in flesh and milk. Feed all summer when the land and pastures are poor. Feed at any time of the year when the difference between the foods fed in the stable and those procured by the cow in the field do not exceed in cost, the value of the energy expended by the cow in grubbing for her living. Feed whenever it is proved that additional rations, winter or summer, bring not only increased additional profits, but fertility to the fields. Feed when there may not appear to be profit immediately in sight, as when it is desirable to develop the young cow and fasten the milk-giving habit. The young heifer, (often scarcely two years old) should be fed very liberally; if she respond to the feed and gives liberal returns, develops and increases in form and maturity, then it is well; if not, then it should be known at the earliest moment possible that she is a failure, in order to prevent subsequent loss.

Feed water, hot water at ninety degrees, in warm stable. As the cow's body is seventy-seven per cent, and her milk is eighty-seven per cent water, and as water is the vehicle which transports and carries all material into the circulation of the system as well as out of it, then water becomes of more importance than food. Since dairy cows consume three pounds of water to one of food, too much attention cannot be paid to the water supply of our animals, especially those in full milk. Since it takes more heat to raise a pound of water one degree in temperature than any other known substance, but one, the question always arises, whether it is not better economy to heat water with coal at four dollars a ton, than to heat it with corn meal at twenty-five, and timothy hay at fifteen dollars per ton. Since it requires much heat to evaporate water, it is always well to keep the dairy cow from becoming wet, or even moist, during the colder months of the year. Since the temperature of the cow must be maintained at over one hundred degrees Fahrenheit, it always becomes a subject of great economic consideration to know whether it will not pay to make the stables so that the thermometer will seldom fall below fifty degrees. Since animals lose their appetite easily in the winter, when the temperature in the stables rises above sixty-five, the system of ventilation and construction of the cow stable, is of the utmost importance. Since most of the cow stables in the State of Maine provide not more than two-thirds of a cubic foot of air space for each pound of live weight of animal kept in them, and since a dairyman, weighing one hundred and fifty pounds, if provided a bedroom six feet long, four feet wide and four feet and one inch high, would have relatively the same amount of air space as his cows, might it not be well to make a more careful study of the conditions which surround the cows, and the dairyman, when confined in their winter quarters.

May we not here and now discuss more in detail, than I have been able to do in this paper, the best means of improving the cow, her food and water, her comfort and care, for these are the sure foundation upon which selection and inbreeding and fuller success must rest.

Ques. Please give us your idea of the cow stable.

Ans. The best wall that we have is a double boarded wooden wall, stuffed with straw. Straw is better than saw-dust; wheat straw is best. For several years all the out buildings on my prairie farm in Iowa were constructed out of rough, cheap boards and straw or prairie hay. Walls constructed in this manner are free from dampness, reasonably warm and permit the air to circulate very slowly through them, thus giving good ventilation without drafts. Then, too, straw filled walls do not become damp like stone walls. We never think of sleeping in stone cellars ourselves because they are damp and unhealthy. They are scarcely less so for our cattle. The outside boarding for the straw filled wall should be put on vertically, the inside horizontally.

Ques. Where do you keep the cows?

Ans. Either in the first or second story of the barns, as is most convenient. If in the lower story, but one side of it should rest against the earth.

Ques. What is the objection to paper between the boards?

Ans. It is too close and does not permit any air to pass through the wall. Then in order to get good ventilation in these light walls the air must be brought in, in one, or at least a few places; this usually results in cold drafts which are dangerous in a winter dairy; better a somewhat impure air than drafts cf cold air. I am satisfied that stone basement stables,—the greater part of the walls being under ground,—are detrimental to the comfort and health of the cow; if so, they should be abandoned as they result in loss.

SATURDAY FORENOON.

Exhibition of cheese by Professor Cheeseman.

EXHIBITION OF THE USE OF THE BABCOCK TESTER.

By Prof. Bartlett.

The Babcock method simply separates the fat from the milk or cream. A certain amount of cream is put into the flask and an equal amount of strong sulphuric acid which dissolves everything in the milk except the fat, then the bottle is put into the centrifugal machine, such as you see here, and the wheel run very rapidly. The fat collects on the water or top, then the heat brings the fat into the neck of the flask. These cream flasks read as high as twenty-five per cent and as low as one-tenth of one per cent. When the fat is brought into the neck of the flask, the lower reading is taken and also the upper reading; then the lower reading subtracted from the upper gives the per cent of fat in the milk or cream. This fat is not butter. Butter is only eighty-five per cent fat; but it gives the basis on which to value the cream or milk.

Ques. Do you put an equal amount of milk or cream in each flask?

Ans. It is measured in equal quantities. The amount is eighteen grams. You will see the fat here; (taking a flask from the machine) this is poor cream, not much richer than some milk. It contains seven and a half per cent fat Here is a sample of skim milk, and contains about three-tenths of one per cent of fat. Very rich milk will yield as high as six or seven per cent. We sometimes get cream that carries over thirty per cent of fat. There is a variation; it sometimes runs as low as two per cent. Different cows in the same herd vary and different herds vary.

Ques. What is the difference between the Holstein and Jersey herds?

Ans. There is about three per cent difference in favor of the Jersey. The cream varies as well as the milk. The variation is from twelve to thirty-five per cent.

Ques. What is the cause of this variation?

Ans. The difference in temperature at which it is raised.

Ques. Which makes the richest cream, from cold or warm?

Ans. Raised at a warm temperature.

Ques. Is the cream of the different breeds of animals raised under the same conditions, and the different animals of different breeds?

Ans. Yes. The Jersey has the richest cream, the Holstein next. The Jersey cream raised at a certain temperature contains more butter fat than the Holstein.

Ques. Is there the same difference between the amount of solids in milk as there is between the amount of fat?

Ans. I don't think there is quite as much difference, yet there is a big difference.

Ques. How are you going to make use of these percentages in fat; if half a dozen men send in cream, and you find this difference, how are you going to apply this information?

Ans. It would simply show the comparative value of the cream. You must know this to divide the profits; you must know the basis of fat. The fat does not vary at all, practically. I think the Jersey fat is richer. There is not much difference between the Holstein and Jersey.

Ques. What does a tester like that you have here, cost?

Ans. A machine of this size would cost about $25. There are smaller ones; you can get a machine for ten dollars of Cornish, Curtis & Green if you want one for a private herd. It can be used for testing milk as well as cream.

Ques. How many samples can you test in two hours?

Ans. I think we could make twenty tests an hour.

Ques. You would take individual cow's milk given at one milking?

Ans. After thoroughly mixing it.

Ques. Couldn't your modified flask be added to the equipment of the small machine?

Ans. I don't know but you can get a machine, but you need a larger pan. This pan is three inches larger in diameter than the milk testing machine; you would have to make it to order.

Ques. Would a milk testing machine have this arrangement?

Ans. Yes, just the same, except the pan is smaller; it would have to be whirled more rapidly.

Ques. Why do you have to have a larger machine for cream, than milk test?

Ans. Because the cream flask is longer, about an inch and a half longer. If you reduce the cream one-third, in the final percentage you would have to multiply the error by three. The smaller quantity you take the more correct the result is.

Prof. ROBERTS. Have you used the Bimling tester?

Prof. BARTLETT. I have not; it is on the same principle.

Prof. ROBERTS. You can get one of small size for about six dollars. The farmers are interested in these things;—our students are called on to go out into the country and test herds. They prefer the Bimling machine because they can take it easier. There is quite a trade springing up of testing milk. A student who is working his way through the University travels from one place to another testing individual herds; tests the milk morning and night for two days. The boy gets his board and five dollars.

Ques. Are you obliged to make an error in reading?

Ans. It is almost a necessity unless you observe every condition.

Ques. Under the conditions in which factories are worked, will not errors almost always creep in?

Ans. Yes. If work is reliable the error is small,—the error on twenty-five per cent cream would be not more than one-half of one per cent.

We run in about an equal amount of acid to the amount of milk. You can see that the caseine is coagulated first by mixing with the acid, then it is all dissolved. The next process is to whirl the bottle in the machine five minutes. The fat in that time is all collected on the surface. Then fill with hot water from the tank; fill to same point in the neck then whirl one or two minutes more to collect the fat on top of the water.

Ques. Is that liquid of the same temperature as it was before you put in the acid?

Ans. It was with a temperature of about one hundred and fifty.

Ques. Is it necessary to put water in the tank and keep it hot while using it?

Ans. It is not necessary. If you are making the test in a cold room it would be necessary to have hot water in the tank in order to keep the fat in a liquid condition so it could be measured in connection with the water.

Ques. Is there any way that this can be used to test cream that is brought to the butter factory?

Ans. It can be done by all these machines.

Ques. There is always an amount of skim milk; it might vary. I don't know as you could get at it.

Ans. Samples of cream you are going to test should be measured in quarts; you can also measure the inches of cream; but calculations of the percentage of fat must be made from the measure in quarts; or the cream could be weighed.

Prof. ROBERTS. Take milk that the tester gives four per cent of fat reading; what may a fairly skilful dairyman expect to realize of butter with the amount of water twelve or fifteen per cent. I want to ask if he may not confidently expect with good management to realize a little over four pounds of merchantable butter for his hundred pounds of milk? While it is not exact, because anything is not perfect we have no right to turn it away if it helps our judgment.

Prof. BARTLETT. I think he would realize a trifle over four pounds to the hundred pounds of milk. At Prof. Winslow's creamery we made tests last winter of some buttermilk from the churn; we also made tests of buttermilk from his test churn. There was quite a variation in the buttermilk from the test churn. The buttermilk from the cream from some herds, contained twice or three times as much fat as some others; but in making the test from the large churn, we found the percentage of fat in buttermilk very low, showing that when this cream was all mixed together it separated more thoroughly than when the cream was churned separately.

In testing in the creamery some of the samples of buttermilk from test churn, yielded as high as six-tenths of one per cent of fat, while the fat in the buttermilk of large churnings when all the cream was mixed together, yielded less than two-tenths of one per cent.

Ques. Have the test churns been discarded as unreliable?

Ans. I think they have. The one I saw at Professor Winslow's creamery was simply a lot of cans fastened to a machine that vibrated back and forth by steam power, swinging half way round.

Ques. Then testing in those different cans the results were as you found them?

Ans. Yes. The greatest error in butter is the water; again there is the cream from some animals, where the butter will not separate readily alone; it seems to separate much better when mixed together.

Ques. Do you consider that the small churns as a whole, that are used on the farm, will do as perfect work as the larger churns?

Ans. I should think it would depend somewhat upon the size of the herd of animals.

Ques. Do we not invariably find it a fact that the churn is too small of almost every dairy farm and leaves a larger per cent of fat in the buttermilk?

Ans. I have not made tests, but I should think it might be so.

Ques. You say you find poorer buttermilk in the large churn?

Ans. Yes, but that is not simply from the size of the churn; it is in animals. The cream from certain animals does not separate readily by itself; it separates more perfectly when mixed.

Ques. Can anybody use the test-churn as well in small as in large lots?

Ans. I suppose not. I should say on the whole there would be more butter realized from the amount of cream if carried to the creamery than if churned in small churns.

Ques. Prof. ROBERTS. There is to be a great contest of breeds at Chicago in '93; there is fighting on the docket now as to what shall be the final arbiter of the amount of butter fats. One faction says that the churn shall be the final test; the other, that the churn shall have nothing to say about it, but the butter maker. What would be your opinion as to what should be the test of the quality of cows, the churn or the chemist?

Ans. I should think the chemist would be more accurate as to the value of a cow.

Ques. The common farm dairyman of course is not in a position to use that, but the question I wish to ask is this, which would be the most practical way for farmers, which would be nearest exact to take the milk and set in a glass tumbler from every cow and observe the depth of cream in the tumbler after it has set a certain time, or try to get used to this new way?

Ans. There would not be much difference in the test provided you test the cream; but as the cream varies from different animals to quite an extent, I should say this would be a more accurate method of testing. You simply measure the cream and judge that the cream from one animal that yield perhaps twenty-one per cent fat, and another under the same conditions twenty-two per cent fat. There is much difference in the cream raised under exactly the same conditions. Then churn that cream and you would not get it strictly accurate because the yield of butter varies.

Ques. What evidence is there that two per cent of butter fat may not be in that buttermilk?

Ans. I have not found as much as that. The farmer can remedy that with the milk tester. You can find out how much butter fat there is in the milk and how much in the skim milk and how much in the buttermilk. That wakes a man up to find out where a screw is loose. When I get a new cow, when she is in condition to give about the same quantity daily, I set her milk separate for four days and churn that by itself to see how much butter she gives; and compare her with others I have tested in my herd. That is the best I can do.

Ques. Mr. PARKMAN. I am interested in the creamery business. Last week I gathered six hundred inches of cream and churned it getting two hundred and forty-one and a fourth pounds of butter. The next day I gathered three hundred and fifteen inches of cream and got a hundred and sixty-four pounds of butter. What I am after to-day is to find some kind of a test to ascertain how much butter there is in a given amount of cream. All the test I have is to take a certain amount of cream from one farmer and churn it separately, then I go by that and average a pound to two inches of cream. If there is anything to guide me I want it.

Ans. That is the object of this method.

Ques. The point aimed at by Mr. Clifford is to find two per cent of fat in the buttermilk which his churn does not extract. How is he going to get it? Your answer was that it may be brought from using a larger churn. Is that necessary?

Ans. The only test I have made myself, as I said before, was at Mr. Winslow's creamery. A lot of samples of cream were churned there with the buttermilk varying very much in the contents of fat. Some were as low as two-tenths of one per cent, and there was one as high as six-tenths of one per cent. When this same cream is churned in a larger churn, the buttermilk is only two-tenths of one per cent, or slightly less than two-tenths of one per cent of fat. That is as far as my experience has gone, but Prof. Roberts has spoken of that.

Ques. You say with the separator, that the milk that you got from the separator after the cream was taken out, contained what per cent of fat?

Ans. The samples I have examined were as low as two-tenths of one per cent.

Ques. In this matter of testing samples, churned by the test churn also by the large churn, are you sure that the cream had had the same treatment, was at the same temperature at the time it was churned that the cream was in the large churn?

Ans. Some of the samples were not in as good condition; those did not yield as large a percentage. Those that were in as good a condition as possible were as near alike as possible.

Ques. What do you call good work with regard to buttermilk; how much are we obliged to leave in?

Ans. We cannot expect to get much lower than two-tenths of one per cent. Ordinarily, if the churning is done as it should be there is not much more than two-tenths of one per cent. You cannot find out without you make the test. That varies with the animals.

Prof. JORDAN. I want to speak of our experiments in testing individual cows. We have found that the leak is not in the churn, the leak is in the process of raising the milk. To be sure we have these cows, they have been of different breeds, but practically they have churned alike where we have churned three or four different creams at one time. Suppose they have differed a little in the amount of fat in the buttermilk that is secured from a single cow; in a year the amount of that variation does not amount to much in the buttermilk. The leak has been in the raising, in the process. With reference to the question of fat, that depends upon the way you handle the milk. If you handle by a process that takes the fat out of the milk, as the separator; and I believe Prof. Roberts holds that the separator will take it all alike, you can reduce to two-tenths of one per cent. Then this is the best method we have, that we do the best work and you may safely take for practical work that percentage of fat as the standard of the amount. We have found that taking individual cows, it is not possible to realize as large a percentage of fat in the milk or in the butter as in some others. It depends upon what process you use. We want to get down to the foundation fact, that butter fat is what we must have to make butter, and taking the average of conditions, that it is the percentage of butter fat that we can rest upon.

The question has been asked by a gentleman, how he is going to test his various patrons. I don't want you to get confused with the idea that because this machine does not make butter fat, that there is any difficulty in getting at the relative amount that comes from the different patrons.

For example; you get a hurdred inches of cream from A which is twenty per cent. That is equal to two thousand inches of cream at one per cent. You must multiply twenty by a hundred. Another man gives you fifty inches of cream with ten per cent. That is equal to five hundred inches of cream at one per cent; then you have a hundred inches of twenty and fifty inches at ten per cent.

You should give A credit for four times as much butter as you would the other. You haven't got to know what the relation of fat is to butter; take the average condition, and you will get as much butter according to the amount of butter fat from one herd as from another. It is perfectly fair to grade milk on butter fat without knowing whether the machine will make butter or will not make butter.

Pres. FERNALD. In a copy of the *Dairy* published in Chicago, I saw the statement made by a gentleman who owns a separator, that he has a herd of sixty cows and calves. He has between sixteen and twenty in milk all the time. He says that his separator pays and he has a herd that does not average over twenty in milk. If that is true, that fact may be suggestive in small neighborhoods where a separator may be used to advantage.

There is just one point in connection with this subject that seems to me to be suggestive also; it is this;—this Babcock method of testing and other methods of testing will enable us to determine the precise percentage of cream in milk or the percentage of fat. The next problem is to get it out. In skim milk there is an amount not accurate. Is it not a legitimate problem for the station to solve and settle that matter for the farmer, in what way they can get the percentage reduced to one-tenth of one per cent; cannot they devise a churn; isn't it legitimate work for the Station to do? Also to determine, not only how much butter there is but in what way that butter fat can be obtained and put into the form of butter.

This discussion may be suggestive to any station in the United States so far as the same facts come before them.

Another point, and that is the matter of error, error in reading. Some questions were asked relative to that. Do not trouble yourselves about the error, as with this Babcock instrument; there is an error of personal observation that comes in everywhere. There are no two men who measure a half bushel of oats the same; you will get quarter of a pint more from one man than another. No two men measure everything alike; it is almost infinitesimally small but I have noticed in buying that that personal equation comes in to quite an extent.

When I was a boy, a barrel that would contain a hundred and ninety-six pounds of flour would hold two bushels and three pecks of potatoes. Now the same sized barrel will hold a little over three bushels. The error of this instrument is not a hundredth part as great as that.

CHEESE FOR THE STATE MARKET.

By J. J. DEARBORN, Newburgh.

It is a common practice among the milk producers of the State of Maine, to deliver milk at the factory between the hours of five and eight A. M., the milk of the night previous having been cared for by them, according to their own ideas. I will therefore confine my remarks on the subject to a single day's work.

In the first place, we receive and weigh the several lots and conduct them to the vat, always applying a sufficient amount of heat to raise the mass to the temperature of 84° by the time the last mess is received. It has been my experience to be obliged to make this preparation, that the rennet may be added before maturity has proceeded too far. In the matter of associated dairying it is seldom found necessary to allow a vat of milk to await maturity.

With the milk at this temperature (84°) I will now add sufficient rennet to coagulate the mass in about one hour ready for the knives. The only test I use to determine the point when the curd is in a perfect condition to cut is when it will break smoothly over the finger without whitening the whey. We will now apply the knives, cutting both lengthwise and crosswise with the perpendicular and lengthwise with the horizontal, leaving the curd in small cubes about one-half inch.

This done we commence to apply the heat—very slowly at first—keeping the curd in constant motion, noting the change which is constantly taking place and by a knowledge which experience alone can teach, manage as nearly as possible to preserve a healthful balance of power between heat, rennet, salt, moisture, lactic acid and the atmosphere, which are the principal natural agents which must work together, in the fabrication of good cheese, never allowing the heat to drop until the final separation of the curd from the whey. During this portion of the work the temperature is raised to about 98°—more or less as the time of year and locality shall determine. The whey having been drawn we will proceed to dip with the first appearance of acid. If we want a soft cheese, we dip soft. If a harder cheese is desired we allow the curd to harden more before dipping. If the cheese is to be consumed in from twenty to thirty days from press, about $2\frac{1}{4}$ pounds of salt to every hundred pounds of curd will do. If in sixty to ninety days $2\frac{3}{4}$ pounds will not be any too much.

After dipping, draining and cooling to about 85° we add the salt, the particles of curd at this point being about the size of corn. After thoroughly mixing the salt with the particles of curd, being careful to air it properly, we have it ready for the press. It is then dipped into the hoops and placed in the press where it remains about twenty hours at the end of which time the cheese are taken to the curing room which should be kept at a temperature of 80° for April, 75 for May, 70° for June and July and 65° for August, September and October.

In order to meet the demand of the market—which requires a soft, mild cheese—this cheese must be consumed up to the first of August at from fifteen to thirty days from press. After that time they may be kept all winter.

In conclusion I will say that the success of a cheese factory depends largely upon the management of the milk by the farmers, as it is impossible for any cheese-maker to manufacture a first-class cheese out of poor, sour, tainted and skimmed milk. The one thing needful for the success of co-operative dairying is an inspector of milk who should be appointed by the State and receive his salary from the same source, and be required to visit each cheese factory while in operation as often as might be necessary. It should be his duty to inspect each patron's milk and have the condition of the same published in any local newspaper. This would have a tendency to suppress the uncontrollable fraud which is practiced wherever milk is sold.

DISCUSSION ON THE PAPER.

Mr. DEARBORN. I have been a manufacturer of cheese for twenty years; have manufactured four hundred tons of cheese that have been consumed in the State of Maine. I find the market demands a soft mild cheese. I have samples of August and October cheese which I will pass around. (Samples shown).

The October cheese is that which is called for by the market of the State of Maine. It is made out of perfectly sweet milk, no cream taken from it. The other is August cheese, made in the early part of August. I have also a sample of cheese manufactured from a poor batch of sour milk in the month of May and another sample made three years ago next June.

Ques. What per cent of butter fat is lost in making cheese; how nearly can you appropriate all these butter fats?

Ans. In a vat of milk that weighs two tons, all the way we have to determine is by what rises on the whey vat. What is raised on two tons of milk will manufactureabout two pounds of butter.

Ques. Do you believe that is all the butter fat wasted?

Ans. Yes, I presume it is.

Ques. Do you buy milk by the Babcock test?

Ans. I never used any but the old fashioned tests. The best test I have used is when it runs off from the whey can; I note the color as it runs over the smooth tin. If it is very dark colored and has a thin look I think the milk may have been tampered with. If it looks white and nice I allow that to go.

Ques. After the cream has risen on the night's milk, as of course it will more or less, can that be retained in your cheese?

Ans. Most certainly, the larger part of it; I suppose that is when we make so little loss, in mixing it. We don't believe in half skim milk cheese in Maine.

Ques. What per cent of butter fat will the milk contain as it comes to the factory?

Ans. It is about fifteen per cent cream. We get from twelve to fifteen per cent of cream, taking a hundred per cent as the standard. Of course in the manufacture of cheese it cannot be placed on paper so a man can make good cheese. He has to have practical experience; he must have the milk in perfect condition to do it. Take a single dairy; I think the finest quality in the world may be made; but that brought to the cheese factory is so different; some clean and some *not* clean; some take good care, others no care. A man gets disgusted and refuses to bring milk any longer. In buying milk we have to be constantly on the watch. The first thing I think, is to get farmers to produce a good quality of milk and take care of it.

Ques. How should it be taken care of?

Ans. I should have it aired as it was strained in the can. I would have it aired through a large strainer falling five feet, so a large part of it could be separated with a current of air going through. I would have it placed in water as we commonly take it from the well and stir for a short time and leave it through the night in that condition. Some would as soon take it in the barn where a strong current strikes it from the barn, which is detrimental.

In making cheese like this May cheese, which was made from milk considerably sour, we add rennet enough to coagulate as quick as possible, sometimes forty minutes, then apply the heat and run it up to ninety-eight for half an hour, stirring it rapidly; that wastes somewhat; then dip and salt it and put it in the press. I usually have the curd so when I take it in my hand and press it, it flies apart. In making September cheese we dip it when it first commences to fly apart. I think curd knives cut the globules of butter which makes it waste in pressing. With the old fashioned press and cheese cut with knives there would be little pools of fat on the press board.

Prof. Cheeseman exhibited specimens of butter.

Prof. CHEESEMAN. Before I take up the examination of the several samples of butter I would like to refer any one of you who took part in the discussion of the amount of butter fat in cheese, to an article from the Dairyman, published the 16th of October. I think that is worth three years' subscription,—under the head of Loss in Butter; and the losses in butter have been tested in some cases even in creameries up to six or seven per cent.

I will say here that the statements made here by Profs. Bartlett and Roberts that two-tenths of one per cent of fat remained in the buttermilk is exceedingly good. Now very few come out better than four-tenths. In describing the granulated condition of butter I have found it useful in student work, platform work, to adopt some standard. I have two sizes of shot, which Prof. Balentine tells me are number six and number eight. I choose the larger size as my standard of granulation. One of the two butters to which was awarded ninety-three points this morning, I saw made from the thoroughbred Guernseys in the college barn. The butter came in about that size of granulation.

The granulation of butter in the churn is important. Its uniformity and size depend upon the way the cream is treated. If uniformly ripened, stirred from the time it is set and ripened, you will get uniform granulation in the churn. In removing from the churn I use the Wisconsin fork which can be bought for twenty or twenty-five cents; it can be made by the farmer with a jack knife.

I almost always stir a quantity of salt with this fork, I am extravagant with salt, because I want a good deal of salt in butter in solution rather than in the mass after it is finished.

The first butter I wish to call your attention to was made by Mr. Cobb. It is scored at ninety-three points. The scoring used is this before you: flavor, forty; make, twenty; solidity, twelve; texture, twelve; color, eight; moisture, eight. One score runs as follows: Thirty-six, nineteen, eleven, twelve, eight and seven.

The next butter I call your attention to was made by Mr. Moore from Winthrop. He is an old butter maker, has drawn prizes at many State Fairs. He makes a uniform, good article. The scoring of this is thirty-five, one less than the Cobb butter, nineteen, ten, twelve, eight and seven. The score is ninety-one points. We agreed before we commenced to score butter to take eighty-five points as the order of merit. All butters scoring eighty-five are called meritorious butters; all below are not.

The third butter was made by a Penobscot butter maker. This scores thirty-four, seventeen, ten, ten, eight and seven, and scored eighty-six.

Here we have a sample that scored six y-one: flavor $20\frac{1}{2}$, making $10\frac{1}{2}$, solidity $9\frac{3}{4}$, texture $8\frac{2}{3}$, color *natural*, moisture six.

Mr. GILBERT. I will say that this butter was made by one of the most skilful dairymen in the State. In consequence of his being short of cream to supply his trade, he went to a neighbor and purchased this cream to extend his own product. The cream was properly ripened and an attempt was made to churn it. After some six, eight or nine hours of effort, this product was the result. The cream comes from good herd stock with a reasonably good number of cows, but he had concluded it wasn't best to give them any extra care and feed as he has other business on hand. The result is butter that is absolutely worthless in the market, though it looks well enough.

Prof. CHEESEMAN. Here is butter from Portland, Forest City Creamery. It is very highly colored. We have the explanation that their trade is so good that they could not spare any other than this sample which was produced from cream that remained several days, from cream that was sent to the city and the result is as good as could be expected under the circumstances. It scored sixty-one.

We have some butter from the Bangor Creamery. The creamery declined to exhibit and we are indebted to the president for the sample of butter, purchased in the market to-day, made day before yesterday. It contains a larger proportion of water than any other butter we have on exhibition here. As you will see, the score run up to eighty points which is good considering what the butter is. The flavor is high.

Mr. GILBERT. You will find the butters all score low on flavor; resulting probably from two causes; the inferiority of the feed at this time of year, also to the carelessness that prevails in regard to extreme care about the surroundings of the milk. We must admit the fact that our farmers patronizing creameries are not as careful as they should be in the care of the milk, and the result is seen in the low scale of their product. The matter should receive more attention than at the present time. We cannot make good butter unless there is the best of attention given to the product from the time it is milked until it goes to the table for consumption; no carelessness should be allowed in the co-operative work; it is the business of one as it is of another; it is for the interest of all that good quality prevails, because *quality* controls the price of the product everywhere.

Ques. What is the best feed to produce the best quality of milk?

Ans. Good English hay.

Prof. CHEESEMAN. We have four samples, the product of three breeds of cattle on the farm, and one representing the quality of student work. I will call your attention to them in the order of their scoring. The samples from individual breeds are, one Ayrshire, one Jersey and one Guernsey. The scoring of the Ayrshire shows, flavor 25, make 16, solidity 10, texture 10, color 5, moisture 7, a total of 73 points.

The cream from which these butters were produced was of the same age, treated alike and by the same maker.

The next sample is from the Jersey, scoring 88 points; flavor 35, make 18, solidity 10, texture 11, color 7, moisture 7.

The Guernsey shows, flavor 37, make 19, solidity 11, texture 11, color 8, moisture 7.

You notice quite a difference in the shade of color between these butters.

Ques. Suppose these two breeds of cattle were tested in June, would not that be too yellow?

Ans. That depends entirely upon the market or purpose for which it is made. I have seen more yellow butter, it is perfect for the market in this State, at this season of the year.

Ques. At this season is as yellow butter called for as in June?

Ans. That is a matter of fancy entirely.

Ques. But if that color suits a person the year round and in June it is a good deal yellower, what then?

Ans. That is one of the objections to Guernsey butter; some have rejected it on that account. A friend in Boston had difficulty in getting color; he put one Guernsey cow in his herd and I have seen his butter as yellow as that Jersey. I have seen Guernsey butter in Canada from cows which received cotton seed meal as yellow as this, in the months of February and March.

Ques. What quantity of salt should be applied to a pound of butter?

Ans. The market in this State requires about one ounce of salt to the pound of butter. When the butter is partially worked, the salt is applied. I prefer to salt butter when it is in the granulated condition, using one and a half ounce. A great part is worked out, so that not more than two per cent is left in the butter.

In this students' butter which was made at the same time with the Guernsey butter, the granulation is not quite as perfect. This butter scored eighty-nine. It is fair to say that this butter was made at a more recent date, from cream not as highly ripened as the Jersey. Flavor, thirty-five; make, eighteen; solidity, ten; texture, eleven; color, eight, and moisture, seven.

Dr. TWITCHELL. How long after raking in the salt, before you give it the final working?

Prof. CHEESEMAN. I should recommend it to be set away; but as soon as the butter is removed from the churn, any quantity of butter, from seven to eight hundred pounds, must be salted immediately; you must leave in a large quantity of water, being careful always not to allow it to get too cold. We have a large dial thermometer; we watch that carefully and try to keep that end of the room at a temperature of about sixty-six or sixty-eight. If it rises to seventy, we raise the windows and cool it off. We must keep the temperature of the work room at such a point, not to get the butter too soft.

Ques Does it injure butter to freeze it?

Ans. I don't think it would but I am not qualified to say; I never had experience with frozen butter.

Ques. With regard to the butter passed around as Ayrshire butter, I would like to know if that is a fair sample of butter made from Ayrshire cows, as a rule.

Ans. I have never seen butter of that kind uncolored. The Ayrshire butter which I have seen produced in creameries in Canada, was almost invariably carried to the creamery and churned with the cream of native cows. It is colored for eight months, artificially.

At Mr. Gilbert's request I have some samples from the Guernsey Creamery, N. H., built during the past winter by the Deer Foot Farm Company. There was a large proportion of Guernsey and their grades. They do not call this a creamery, but call it the Guernsey dairy. I will show you three samples of the butter they made at that factory. (Butter exhibited, also picture of the creamery.)

This part of the print was exposed for exhibition yesterday and has salt upon the surface; it is sweet cream butter having the monogram of the Deer Foot Farm. You will see the difference in the three samples. The three kinds I show you are the Deer Foot Farm, the standard butter made from sweet cream, another made and printed so as to be divided into eight ounce pats, and the third has the monogram of the Guernsey dairy. This sweet cream butter was scored by myself and gives, flavor 37, make 19, solidity 11, texture 11, color 7, moisture 7, scoring 92 points. The other two samples are alike, they were made from cream slightly acid, heavier salted. Mr. Gilbert scored it only 90; I made it 89.

Ques. Did you ever find butter that scored a hundred?

Ans. Very rarely. I was once at a fair where Mr. Ed. Laughton's butter was exhibited, made by Mr. Richards and which sells for ninety cents a pound. These samples were made from the same cream. In one case the cream was churned sweet, in the other it was ripened. One kind is Guernsey dairy butter the other Deer Foot Farm. I am sorry we have not samples from the Monmouth Creamery. One of the best butters I have ever seen, was at the State Fair. It was a credit to the factory and a credit to the cows.

SATURDAY AFTERNOON.

G. M. TWITCHELL.

Mr. President:

I have in mind a motion which it seemed to me should be presented, but before presenting it I would like to say that I think we have, all of us, since coming here yesterday morning realized better than ever before, what our State Institution is aiming to do for agriculture in the State as well as in other departments. This building and the other buildings are especially arranged and fitted for the work of helping in the way of better means and better methods on the farm. I am in hearty sympathy with what has been done and believe we all are. Let us all carry the thought of the school home with us; carry a measure of responsibility and keep it in mind, because however faithful the officers of this Institution may be, however hard they may labor for the advancement of the college in the several departments, it will not do the best possible work unless it has the hearty sympathy and support of the people.

As representatives of the people, we should go home and use our influence, all of us, to increase the number of students in attendance. Send up your boys and girls, use your influence to get your neighbor to send his, to receive instruction in these special lines. Let us see if we cannot and will not do our duty by the college as they have been doing their duty by us.

I move that as visiting members, we express our thanks to the officers and students here for their cordial assistance in making this meeting so complete a success.

Mr. Gregory. Certainly I am in sympathy with the motion that has been presented by Dr. Twitchell. I feel that we are under special obligations to the officers of this Institution for the opportunity of visiting the various departments, as well as the privilege of listening to the addresses at the several meetings; therefore, Mr. President, it gives me great pleasure to second the motion made by Dr. Twitchell.

(Rising vote.)

FOOD PRODUCTION FOR THE DAIRY.

By Professor I. P. Roberts.

Mr. Chairman, Ladies and Gentlemen: I am pleased with the vote you have just taken. I am glad to see that up here in this north country you are beginning to realize that about all there is in this world that is really worth preserving and cherishing, is an educated, morally and physically well built *man* and *woman*. So eager are we for results that we forget to study the law that governs the cultivation of soil. Like the man on the river side, who is so anxious to reach out and gather the straws that pass by, that he lets the sheaf go; or the man who holds on to the penny so penuriously that his hand never opens to receive the dollars.

We were given dominion; we are to keep the garden; we are God's vicegerents; we are set here to make all things conformable. We are to say to the tree, bear rich fruit, and it is so; bear sweet fruit, it is so; bear large fruit, it is so; bear abundant fruit, and it is so. So we may be Godlike if we will use the power given us and we are omnipotent within our sphere. We say to one plant, depart hence, it obeys; to another, grow, multiply, bring forth much fruit, and it is so. We are here to direct the forces of Nature, to so control and guide them that they will finally bring the greatest blessings to the greatest number of the human family. To do this wisely, the laws which govern vegetable and animal life, and the physical forces which lie behind them must be understood. The soil with its vast store of plant food, must be cultivated intelligently, if the best results are received.

Soil to the depth of nine inches, at Cornell University, upon which we have been raising thirty-five to thirty-six bushels of wheat to the acre, contained 3,094 pounds of phosphoric acid, 3,410 pounds of potash and 1,876 pounds of nitrogen.

Some soil analyses of Europe show that the most fertile soils contain about one-fourth of a pound of potash, one-eighth of a pound of phosphoric acid and one-half a pound of nitrogen—though this is very variable—to a hundred pounds of surface earth.

An acre of land a foot deep weighs in the neighborhood of 1,600 tons. This gives on an acre of good arable land, 8,000 pounds of potash, 4,000 pounds of phosphoric acid and 16,000 pounds of nitrogen. At four, eight and sixteen cents a pound respectively, the acre one foot deep would contain $3,200 worth of plant food. This is a farmer's bank from which he may draw continually if he draw wisely.

In a few cases it is said that 40,000 pounds of nitrogen have been found in a single acre of land one foot deep.

Fifty years rotation—ten years in wheat, twenty bushels per acre and the straw; ten years in corn, forty bushels to the acre and six tons of green fodder; ten years in oats or barley at forty bushels to the acre, with the straw; twenty years in hay, one ton per acre, removes $400 worth of plant food per acre.

Is it wonderful that the land does not sell for as much as it used to? We have sold our farms in many cases in a half-bushel at the railway station. When we sell $200 worth of wheat, $60 worth of plant food leaves the farm; when we sell $200 worth of horse—1200 pounds—we have parted with $7 of plant food. If we sell $200 worth of butter for twenty-five cents a pound, almost no fertility has been parted with. Butter is only concentrated sunlight which slips down to us from the gods on a sunbeam.

Could we expect land to go on producing forever while we carry off constantly far more than is returned? What is the remedy? Certainly nothing can be gained by cultivating more acres, because enlargement means greater expense with less product per acre, and less yield means greater loss. Better returns can only come from concentrating labor and fertility upon fewer acres; the productive power of each arable acre should be doubled. As the railroads have cheapened the cost of transportation so must the farmer cheapen the cost of production.

Last year the yield of hay in Maine according to agricultural statistics, was less than one ton per acre. This will not do unless we are farming simply to get a little healthy exercise.

The product per acre of all crops averages less than one-half what it should; the cost of production is too great; energy is diffused over too wide a territory; the markets are glutted with products which have been gleaned from wide areas, often at a loss. These undesirable conditions can only be improved through a better understanding of the laws and forces with which the farmer has to do. A knowledge of these laws can only be secured by careful systematic training, and what place is so good to secure this as at your own Agricultural College. Somehow we must shorten the rows. How shall it be done? Let us commence on the farm for there is where we have got to end, and conclude that some of the land will not pay for plowing, so it may be seeded to grass. That will shorten the corn row somewhat; then take the best of the land and see how much can be raised on it profitably. All other industries are concentrating their forces, thereby securing greater profits; then we must make the corn row shorter and the load of manure richer in plant food. When we have learned to raise a few acres of grass and a few acres of corn profitably, then the area may be increased until the poor acres are encompassed, provided the yield is large enough to secure fair profits; if not, then let the poor depleted land raise what grass or weeds it will. The corn must be raised in short rows if it is raised at a profit.

Corn, the most useful of agricultural plants, can be raised in Maine as well as in Illinois, about the only difference being that the large dent varieties will not fully ripen in the north, but this makes little difference if the corn is used for ensilage. True, the yield of "stover" is not so great, if the "indurata" varieties of Maine are cultivated, as it would be if the dent varieties were planted, but the yield of grain is likely to be nearly or quite as large with the one variety as with the other. When corn is grown for ensilaging, there is usually too much seed used; corn is a sun plant and hence does not do well when planted or sowed thickly. Peach trees planted four feet apart, and corn planted so thickly that it takes one bushel of seed for an acre, do not give the best results. As much superior as the peach is to the leaf, so much superior is the ear to the stalk. Without doubt, the way to get the largest number of pounds of beef or butter from the product of an acre, is to get the largest number of bushels of corn possible. If one variety is equal to another in yield of grain and superior in yield of "stover," then it should be selected; but if the yield of grain be smaller though the "stover" is greater, then it should be discarded. Usually the largest growing variety which will get nearly mature before frost, in any given—northern—locality, will be found to give the best results.

Corn requires an abundance of warmth, light and moisture. It does not necessarily require a long season; if four to six weeks of hot weather can be secured, though the spring and fall may be cool, a good growth can be secured with a fair yield of grain. To get warmth, the land should be made *loose in the spring* so that the sun and air may bring warmth and a reasonable degree of dryness. If the right kind of a planter is used the ground need not necessarily be very fine. I find the two horse (concaved) wheel, western corn planter very superior. It marks one way, plants, covers and rolls two rows at a time and is capable of planting in drills or hills from ten to twelve acres per day. To secure light and *corn*, the rows should be from three feet six inches to three feet eight inches each way and not more than four stalks to the hill. Usually the worst weed among corn, is corn. If too many plants on a given area are present, they make so great a demand for moisture that the soil under ordinary conditions cannot supply it, so all the plants become dwarfed and the yield of grain is diminished. Then, too, if the plants are too close together, they do not develop chlorophyl and hence cannot make rapid, healthy and normal growth. Corn requires large amounts of water during the period of active growth which occurs at that season of the year, when moisture in the soil is likely to be deficient. This being the case, the utmost care should be taken to conserve moisture and this can best be done by flat, frequent, shallow culture. This method of treating corn not only conserves moisture, but furnishes the best possible conditions for setting free plant food, especially nitrogen. It appears to me that a good corn crop is so superior to the average yield of timothy hay, in your State, that it is worth while to make some effort to learn the best methods of corn culture. But one should not entirely depend on corn; wherever colts, dairy cows and sheep are kept, some roots should be cultivated. Carrots for the colts, mangolds for the cattle and flat turnips for the sheep. Mangolds and carrots should be planted as soon as the land will do to work; that is, as soon as possible, or about one month earlier than they are usually put in the ground. Turnips will usually do well if sown with fertilizers on clover stubble the first part of July, if the ground is made fine and *firm*.

Ques. Would it be better for the farmers of Maine to sell their hay at ten dollars per ton or feed it to dairy cattle?

Ans. On an average you get one ton of timothy hay per acre, which is worth at the barns unbaled, ten dollars. Suppose the use of land or interest on its value, and depreciation on improvements, is set down at two and one-half dollars, and the cost of securing the hay at as much more; this leaves five dollars for the plant food carried off, and profit of an acre. This may be fairly divided by setting down two dollars as the value of the plant food and three dollars as profit. The question now naturally arises, can any more profit be made out of the hay in addition to what is already in sight, viz: three dollars? This can only be determined by actual trial. So much depends on the animal, the man and the product, that it is impossible to make even an intelligent guess. Observation leads me to believe that the greatest success is secured where the greatest amount of brain and skill are packed into farm products before they are sent to the market. Those who perform the labor which requires the greatest amount of thought receive the highest wages, and those who do the work which requires the least amount of training the greatest amount of physical energy, receive the least wages.

So there must be more skill and knowledge; the cows which are producing no profit must be discovered and disposed of. And the horses, too, how much do we know as to their profitableness? What are they earning, or what are they doing this winter?

Mrs. GREGORY. Eating their heads off.

Prof. ROBERTS. Yes, this is the truth; and I am glad that some ladies have learned that they are toiling to pay the board bills of idle horses. The French farmer who sells us so many high priced mares uses them exclusively for farming, and these are all expected to raise a colt yearly. There is no reason why the American farmer may not do the same thing, only instead of having the colts come in the spring, they should come in the fall.

Any one who understands how to conduct a winter dairy and raise calves will succeed in conducting a "winter horse dairy." This horse dairy may be made to shorten the rows of cows and the hours of milking, materially.

Ques. How does your corn compare with the ordinary ensilage corn?

Ans. It is more nutritious and more palatable.

Ques. How about the value of the solids in fairly mature corn as compared with that which is immature?

Ans. There is much in favor of the fairly mature corn. It is richer in solids, more palatable and contains a greater amount of volatile oils.

Ques. What kind of mangolds do you plant? What is the cost of weeding and thinning? Do you feed roots to lambs?

Ans. Long red. As to cost of weeding and thinning I cannot say. If they are planted early, the cost of weeding is much reduced. Yes; roots, both mangolds and turnips are fed to the lambs.

Ques. The cost per acre?

Ans. The cost per bushel is from three to four cents. The yield runs from thirty to thirty-five tons per acre.

Ques. How far apart are the roots planted?

Ans. The rows are twenty-six to twenty-eight inches and the plants about eight inches apart in the row.

Ques. Do you cultivate as for a corn crop?

Ans. More frequently and later in the season.

Ques. What manures are best adapted for roots?

Ans. Potash is always in order, though nitrogen and phosphoric acid may also be required. It depends much on the soil.

Ques. How can I get potash if I cannot get ashes?

Ans. Purchase it of the fertilizer dealer.

Ques. How would you find out what kind of fertilizer the land wanted?

Ans. By experimenting; that is, by asking questions of the soil and plant.

INSTITUTE AT SOUTH DOVER, OCT. 27, 1891.

SPECIALTIES.

By T. B. TERRY, Summit County, Ohio.

Mr. President, Ladies and Gentlemen: I am simply a farmer; I have been one for twenty-two years and nothing else. This subject of specialties on the farm is one I dislike most to talk upon, because it is so unpopular. Nineteen farmers out of every twenty are down on anything in this direction. It is just what they ought to hear, but it is not a popular theme, and I don't like to talk about it. I like a subject like that this morning; it was admirably treated and you all agreed with the speaker,—you will not agree with me on the least point; but after all, it may be best to stir you up until you think. That is the way all improvement comes,—by thinking; and we should go on and on in the same old ways, if some one didn't give us new ways.

How did farming come to be what we commonly know as mixed farming, or doing a little of everything? Why didn't we start as specialists? Go back fifty, sixty or seventy years when the farmer came through the wilderness, with nothing, no means of communication with the world, he was simply obliged to raise what he wanted. He must not raise too much of anything as he could not get rid of it if he did. All business was done by barter. That is how the farmer came to be what he is to-day, doing a little of everything. But circumstances have changed greatly since that time and the farmer has not changed accordingly to the extent that he might with profit to himself and in perfect safety. He has gone on in the same lines. All the rest of the world has changed greatly. I was forty-eight hours coming here, a distance of nearly a thousand miles. I slept on a bed at night, and in the morning I got up and went into the dining car and got a good breakfast, without stopping, going at the rate of forty miles an hour all the time. I remember when I was a boy, my brother-in-law started from New York to go to Cleveland, Ohio. I remember that half the people came out to see him on the stage. He was gone weeks. See the difference in the way he traveled and the way I traveled. He had to get off more than once to pry up the wheels. But the farmer has not changed to any such extent; he is going on in the same old way, in the main, raising a little of everything, not doing his best in some particular line to which his soil and circumstances are best adapted.

Now I have a carefully prepared paper on this subject giving all the arguments, pro and con that I could think of. It is in my satchel out in the entry and I will leave it there, and if I do not talk as much to the point as I could with the paper, I may interest you more this afternoon. I will tell you what I have done and that may interest you more than if I should go over the arguments connected with the subject. Twenty-two years ago next month, we moved to the farm I live on now. It had been rented, and eight bushels of wheat to the acre, was considered a large crop. It was in the worst state you can imagine. The tenants had burned the barn doors and fences, and when we built a new house, we sold the old one for $10. We lived in that, however, until we had dug out money to pay a debt of $2,700 and build new buildings, on thirty-five acres of land.

We started on that land to farm as others did.

My father was a clergyman. I didn't know anything about farming, I didn't know enough to get a new plow point, until some of the neighbors told me; I supposed the whole plow went together, and that I must get a new one when the point wore out. We went upon the farm without practical knowledge,—I could tell you how we happened to get it—(a voice,—Let's have it.)

I was in business in town, and didn't like it. We had a little home of our own and about twelve acres of land, on which I built too good a house for the town. I couldn't sell it and the only chance I got to dispose of it, was to trade it for this farm. Now I thought a farm was a farm, and didn't know there was much difference between a farm that produced eight bushels and one that produced forty.

This town man cheated me into trading my nice property in the village for this old place. My Yankee grit would not let me leave and we have made such a success, that I don't want to go now.

That's the way I got my farm and when we got there, we were determined to make something of it. We began without knowledge, doing a little of everything. We had a few cows, five or six, made a little butter, raised a few calves and pigs. Raised a little corn and oats;—I guess it would satisfy any one of you that it was thoroughly mixed farming. At the end of the first year we had taken in, all told, $300 for all we sold from the farm, with interest money and a wife and two babies to support. I don't want to go back to those days.

I suspect a good many farmers are fixed as I was. It was a hard row to hoe. For two or three years we kept on in that way; we couldn't pay all our interest; we couldn't do it, it was out of the question.

My father did not leave me any money, but he gave me a good education and I used the pencil; I knew what I was doing, although it wasn't much. I knew what crops paid me and what didn't; and what it cost me to raise my crops. I remember some rainy days sitting in the barn and figuring over my farming; it had got to pay, what should I do? We couldn't go on so, we couldn't give it up. I am so constituted that a thing has to go through. I found that it would be possible to keep on and do better than we were doing. We could make better butter, get better cows, better blood, more in the butter line, we could make an improvement in the crops; but figure as I might, I could see no way to pay our debts for years on the farm. I wanted to live as well as my friends in the city lived; I wanted to live as well as my sisters in the city, but I could not think of any way it could be done. Then I looked around,—wasn't it possible; wasn't there some way? I remembered that others had said that "where there is a will, there is a way;" and finally, studying over it, I saw that the oat crop didn't pay;—I barely got pay for my labor, but there wasn't any profit in it.

I never raised another crop. I found my corn crop was about the same. I found that my patch of potatoes paid me some money; I found I could make some money out of wheat. I said, what's the reason a farmer cannot be a business man; why must he do a little of everything? If there is some line of business that pays why can not he do it and give up those that don't pay? I worked in that direction mighty gradually; the whole neighborhood was laughing at me, to see the city boy farm. Then there was starvation just over the fence. I did not make any radical movements. The first that you could call that, was selling the dairy. I am not speaking against the dairy, but that was only to forward the plan I had mapped out as best for me. I didn't raise any more calves. I wish I had a dollar a day for all the time I have spent trying to raise cows, skimming and warming milk and lugging it forty rods and at the end of the year the calf was worth about as much as when it was five weeks old, for veal. We quit keeping pigs and chickens, and the last batch of eggs I took to town, was nineteen years ago; I carried a half bushel basket full and the merchant sold me a pair of shoes for a child. He wanted a shilling to boot between the eggs and the shoes. I told him that was the last egg he would get from me. Then I gave that and other things up until we got down to three crops a year, clover, potatoes and wheat; and that has been the way all the time from that day to this.

It took me a good while to get there, and I have confined myself to these three crops and in 1881 we paid the last $500 on that $2,700. Then in 1883, the cost of building a house was $2,500, and four years ago we built a tool house that cost $400 and a barn, $1,400; in all we put $4,500 into buildings on the place, and we have money at interest. All this has been done in eighteen years.

Ques. What did you dress your land with?

Ans. Clover. It don't make any difference whether you put on manure, or let the clover go back upon the land. We must have two or three crops in order to get a rotation. After I got to these three crops, I could push them to the utmost, devoting all my energies to them. We don't raise a few potatoes, but enough to amount to something. I could use my whole strength to increase the production and decrease the cost; and I will tell you that in the last ten or twelve years we have decreased the cost of production about one-half.

The specialists can do this with potatoes at the prices they were twelve years ago. I can put them on the track for one-half the money I could then, and the practical result is we make twice the profit.

That's the point; and that comes within the line of specialties. You cannot do these things, unless you will devote all your energies in one direction; no man can. I have a neighbor who saw how successful I had been in growing potatoes,—he keeps a large dairy.—he thought he could put in potatoes and make as much money out of them as I did. He put in sixteen acres and didn't dig enough for his own use; while we sold over $1,200 worth. He undertook to do too much, and when he put potatoes on top of the rest of his work, he lost. It was a wet spring and he didn't get ready to till them until the weeds got started and the clover and hay needed cutting, and he neglected the potatoes and let them go; and this is the way mixed farming is done. We attend to the potatoes because that is our business; but if I had done all I could in doing everything, I don't believe I should ever have got out of debt. The best that I could do was to undertake one or two things and then push them for all they are worth; that is what brought me here to-day.

Is there any money in the old way of farming? You may not agree with me that we must adopt some special line of work and follow it up and do the best we can, but don't try to do a little of everything; take some line of farming and make a specialty of it. My friend from Vermont will tell you how he makes money out of raising sheep for wool and mutton. I am here to tell you how I make money by making a specialty of potato growing. I don't plant any crop except potatoes, wheat and clover. I have raised nothing else for fifteen or twenty years.

I have solved the question of making farming pay by making a specialty; and I must tell you, friends, that you have a great deal better chance to make money out of growing potatoes than we have. The climate is altogether in your favor. I don't know as your soil is better, but a great deal of your soil is as good, and your climate is better. With the same acres that we produce two or three hundred bushels per acre on, you can be sure of three hundred or three hundred and fifty. You can send potatoes to Boston, New York or Philadelphia easier than we can, you have a better chance for market and I don't see why there isn't money in making potato growing a specialty here. I am not here to advise you; I want to tell you facts; tell you how I have made it pay. I would never like to advise any course to an individual; I don't know just what their soil is; but it is safe for me to tell you how we have made money out of it. I thought I would consider the matter in this direction to-day. Money has to come mostly from reducing the cost of production. The way I have made the larger part of my money, was by reducing the cost of production. Now, I will consider the different ways in which we have done this. I don't know how it is here, but where I live, a great deal of the land needs drainage in order to grow potatoes. In a wet season they are liable to rot. Some seasons you get a crop and others you would not. Te get a good foundation to begin on, I had to tile drain a part of my land, otherwise it would be more or less *luck*. Now we are almost certain of a crop as regards moisture. The next point I considered was arranging our fields so they should be long and narrow, rather than square, but of regular shape. We can plow it quicker, cultivate it faster. We can do everything pertaining to potato growing in a field of that shape much more rapidly.

There is one corner on my farm of one and a half acres, where the rows are twenty-five or thirty rods long. When we plow that it takes a day to plow that acre and a half. In fields where it is sixty rods long we can plow two or more acres. We make time on long rows in planting, digging and all. When we moved down to the farm, it seemed as if there never had been one particle of thought expended in that direction. They had cleared up a patch of two or three acres, fenced and plowed it; and afterwards cleared another. They had been kept in that shape forty or fifty years. Nobody thought they could take up the fence and make a long field.

I went further than this; several acres of timber stood in a field of eighteen acres in such a way that we must plow around it. I saw they must be got out of the way. I cut them down, grubbed out the stumps and now we have it so we go straight through. I remember my neighbor said one day, "You never will get your pay for this chopping in twenty-five years." I think I have got my pay fifty times over. The first crop of wheat brought me $57 an acre. But that wasn't the point; we wanted to do our farming in a business like way so the rows would count when we went through and got back. Fourteen or sixteen rows would make an acre and it counted.

We drill our potatoes with the implements we have, there is no hand hoeing now whether in hills or drills; and we can diminish the cost of production by planting in drills. When it comes to cultivating, the drills must be straight as you can draw a line. Then by setting the cultivator right you can go once in a row and cultivate both sides well—with one horse cultivator. Take an acre that is square, if the rows are crooked and rowed both ways you have got to go twice in a row each way to go over it. It will take more than four times as long as to cultivate when the drills are straight and long. We don't of course stir quite as large a percentage of the surface, there is a little ground between the plants that we don't stir, but we have an implement that will stir this ground, and that is Breed's Weeder. *That*, you can hitch on and take two rows right along, hoeing the potatoes thoroughly. In this way we raise potatoes cheaper. We keep the field entirely clean of weeds in that way. Now we have the field in shape for business. We have it drained so no damage can come from excess of moisture. We have it in shape to do the work quickly. There is one thing more we need before planting; that is simply enough fertility in the soil to grow a large, paying crop. How are you to get that fertility? I will tell you how I did it. First, I hauled a little manure from town. The year before, the tenant hadn't cut the corn that he raised, it was so poor. It was all run down, the available plant fertility gone. We drew a few loads of manure to start with. I was young and green,—I didn't know as much as I do now,—I don't know much now, but I am learning something every day.

I soon saw that I would never get rich hauling manure at $2 50 a cord and hauling so far, so I commenced to keep a dairy and other stock to make manure. I found I couldn't get along fast enough at this. The way I now feed my potatoes is by growing clover in three years rotation. Not by putting in a little clover with timothy and letting the stock tramp over the ground in the fall, but by taking care of my clover. I cut the first crop letting the second crop go back to the earth; the ground chock full of roots, the surface mulched all the time, so it was increasing in fertility all the time. We save every drop of manure with cemented floors. I am told you are troubled with rot. I have never had any trouble and we have grown a great many thousand bushels of potatoes. I will tell you two reasons. They are thorough drainage and the feeding of the crop with clover roots rather than stable manure. We put manure on the clover as soon as we take off the wheat; on the young clover, put it on where it will do the most good. There are parts of every field that are rich enough; on others a little manure is needed. We go over with a great deal of care and put it on finely and evenly; put it on so the whole field shall grow up one uniform mass of clover; put it where there isn't a thick, rank growth of clover. When you get the ground like this, you can grow a paying crop of potatoes; at least I can, and have for a good many years. Fresh manure is inclined to increase the rot. We have our fields in the right shape, well fed, now when shall we plow it. I am a thousand miles from home. I presume that fall plowing is wise and best for you; it is not for me.

In my locality it is more work to put that land in shape in the spring if plowed in the fall, than to plow and fit both in the spring. We don't plow until the ground is dry enough to crumble. You must never go upon the land until it is dry and mellow. If you go o . and plow when it is a little wet the horses tramp it down, and we never harrow in the spring until it is quite dry; but I am not in the habit of doing a great deal of harrowing before planting the crop.

I used to, years ago, but our springs are sometimes very catching,—sometimes for two or three days we get good weather, then ten days of bad. We can work it after the crops are in. I hitch three horses abreast and we get things done in a hurry. I think three abreast are as good as four with one team ahead of the other. We do that as soon as we have plowed. The last operation before starting the planter, is to roll the surface lightly. We plant with the Aspinwall planter. It does not do perfect work but better than nine out of ten hired men. An expert will drop potatoes better than a planter. It will make a miss once in thirty-five or forty times, but that don't amount to very much. The planting, of course, is done by machinery. There is no work about it. I sit on the seat and drive, but it requires a little skill to get the rows started,—to start them straight. Then by being particular I can keep them straight. You can do better at cultivating if they are perfectly straight; it reduces the cost of production,—it is quite important to get them straight.

After planting, I sometimes surprise a new man—I don't like to change a hired man, but at the end of two or three years they generally get to know more than I do and I have to send them off, I often surprise the hired man. I say as soon as we get through planting, "Now get out the cultivator and begin work." That surprises him. We begin as soon as they are planted and draw that cultivator as deep as a strong horse will draw it and tear the soil all up. In two or three days we take the Thomas harrow and go lengthwise of the rows and harrow it again; then in five or six days, harrow again; harrow about three times before they come up. This gets it level just before they come out of the ground; it prevents every weed from growing. There is not a weed there. We have harrowed two or three times; the weeds have sprouted and are destroyed and will not bother you. As soon as the potatoes are up so you can see the rows to follow them, we take Breed's weeder and go through. It would hardly do for some of your stony fields; it is a light implement; but if you want to make a marked success in potato growing, you want perfectly clean land. You had better go to a good deal of expense and get your land clean. I worked a great many days sinking boulders. That improved the land and I picked up the small rocks, so there isn't now one obstacle. I can let the horse go four miles an hour without risk of hitting a stone. As soon as the plants are four or five inches high you commence to cultivate. If there comes a heavy rain so the weeder will not take hold, I start two men with the cultivators, then follow with the weeder. They stir the ground between the rows, leaving a little space about eight inches wide in the drill. I can stir that thoroughly with weeder as well as you can with a garden rake, and smooth down where they have cultivated between the rows. We keep that up until the potatoes are about half grown, then it will harrow the bushy tops over and we stop use of weeder but we run the cultivator as long as a horse can go between the rows. It requires some courage to harrow right through the hills. I know the first time I used the Thomas harrow on potatoes, I was glad there was no one in sight; it hurt me awfully to drive the horse right over the potatoes; it was so contrary to the way I had done it before, but I read that others had done it and I shut my eyes occasionally. It knocked the potatoes over; but the next morning they were straighter than ever and I thought they were fifty per cent larger. That stirring all around the hills does make them grow. One point right there, a little out of this line of diminishing the cost of production, but it ought to be spoken of here inasmuch as I spoke of cultivating right along, the cultivation should be all *shallow* after the first time. It would be surprising to many of you to see how quickly potato roots occupy all the ground. When the tops are no more than four or five inches high the roots actually cross between the rows. You cannot run any implement through them deeply after that, without injury. The amount of harm done is owing to the weather. In wet weather if you run through them, they will recover quickly; but if dry, great harm may be done after the roots occupy the ground.

The ground was made for the roots to grow in and it is fatal to tear the roots off and put the plant to the trouble of growing them over again. Farmers don't think what they are doing, but I have seen many a man ride the cultivator, holding down the handles three or four inches deep, tearing the roots of these potatoes. It is the height of folly. It is necessary to stir the surface, so as to get a crop in spite of the season and keep weeds down; but when you have stirred to the depth of an inch and a half, you have done all that is necessary. If you go deeper you will do harm.

Just that one simple idea, has put thousands of dollars in my pocket, in hard cash. I have told it from the beginning; there are few farmers in our State who haven't heard it; still, when a dry year comes, they go right on in the old way.

I have sold fifteen hundred bushels of potatoes for a dollar a bushel to farmers living near me, in a bad season, who had land as good as mine,—better than mine; but they didn't pay attention to these matters and didn't have potatoes in the fall and came to me to buy because I was a specialist. That gives the specialist a chance to make money. Gives him a *chance*, that's all; it don't make a man over.

I don't believe in hilling potatoes. Don't forget this point,—to *not* stir the soil deeply. The stirring helps to check evaporation. It was in 1881 that I made so much money out of my neighbors. That wasn't a full crop, but a good, fair crop. Now that matter is simple. There is seldom a season in our locality when water enough falls from the clouds to grow a good crop of potatoes. Ordinarily, there is not half enough. It comes mostly from the sub-soil below, brought up towards the surface by capillary attraction. Suppose we had a shower on a potato patch; the next morning it was right to go on and stir the soil. You want to do this as quickly as you can. We use Breed's Weeder to stir the surface an inch and a half deep. That makes a mulch. It is just as if you had put straw down an inch deep. Suppose I didn't stir the surface for two or three days. All the shower and more too is drawn to the surface and drawn up into the air to waste. The shower worked for you and then was a chance for you to do something for yourselves. If you do not, more water than came with the shower is taken up from the earth. The shower brings up more moisture from below and when that is evaporated, it takes the other up with it. It is usually dryer soon after a shower than before, when very dry.

I plant potatoes about four inches on drained land, then practice level culture. The reason of hilling up potatoes must be apparent to you. It is the way it was done years ago under circumstances that made it all right. Then most of the hilling was done to cover up the weeds. They took a plough and covered the weeds. When I was a boy we had no such implements as we have now. With the surface implements we have now, there is no occasion to hill the potatoes and it is really a disadvantage. Some folks say that potatoes will be green sometimes, if you don't hill them up. That is a mistake; they will be green more if you *do* hill them up. Plant four inches deep and keep the ground nearly level, and practically, with drill culture, we don't have any green potatoes,—not a bushel in five hundred. There is no advantage in hilling. When the potatoes are hilled up the water runs away in the furrows, and if the land is drained, you don't want it to run off; it takes the moisture out of the field; it takes the ammonia that comes with the shower which helps the crops. It has been demonstrated by experiment, that on soil that is drained, particularly in a dry year, that level culture will give better results than hill crops.

You can see that the ground will not dry out as quickly as when ridged up. When it is ridged up, you cannot stir the whole of the surface; with the level culture you can.

Now we come to the digging. The first digging I did, was with the potato hook. That was twenty-one or twenty-two years ago. Soon after that came the potato fork, a four or five tined fork. I think you could dig as many again in a day. For a long time I thought we were never going to get any better potato digger than a strong man with a fork. I tried a good many. They either left too many in the ground or injured the potatoes and I gave it up with disgust. Now we have two or three diggers that are reasonably successful. I have a large digger, drawn by four horses that takes every single potato out of the ground, takes them up entirely out of the ground, separates them from the earth and deposits them on the surface in a narrow row with every bit of earth off, just as clean as possible.

With four horses on, I can run deep enough not to lose one potato in five bushels. This goes on where there are no rocks and reasonably level; it will go as fast as four horses can walk. Sitting on that, I can do the work of fifteen ordinary men and the money that I used to pay out to men for digging, I keep in my pocket.

The dropping we used to hire done by hand and it cost a good deal of money. It wouldn't cost a great deal if the weather was good, but often it was wet weather and I kept men when I had nothing for them to do. Now that is all done by machinery. I paid out years ago, $50 a year or more for extra men to hoe. Now that is all saved. It is just so with digging. I use the Hoover digger, have used it several years. It is almost perfect, but you cannot use it on a side hill, you cannot go down a steep hill. On reasonably level ground it is all right, but I wouldn't advise you to use it on stony land; but on reasonably clean land it is good. There is no use whatever for a man to grow one or two acres of potatoes; digging by hand or hoeing by hand. It is no use for him to try to compete with the specialist.

I go by a man's house, when I go to town, who plants two or three acres every year to potatoes and tends them entirely in the old way. That man has grown poorer and poorer every year, while we are gaining right along.

Mr. Gilbert said, "Don't keep five or six cows, but if you are going to keep a dairy, keep twenty-five cows and push them "

You cannot make money out of an acre or two. The cost of production is diminished by these new methods. You may as well accept these facts; you needn't fight them. I can point you to men who are making money and they are invariably *specialists*. Do you think your secretary would have brought me here if I hadn't been a specialist? You would never have heard of me.

Ques. Do you plant whole?

Ans. You can plant small potatoes whole, but I use large ones cut to one eye. It wouldn't do to roll potatoes in plaster, the planter would not handle them. I cut to one eye, it is best for me but I don't advise you to do it.

Ques. Have you a machine to cut the potatoes?

Ans. Yes, but we have to pay about $1.50 a day. I am so fortunate as to have two daughters at home; I hire them to do the cutting. I pay them $1.50 a day and I make money by it. They cut twice as much as a man, and twice as well. It comes more natural to women to do such work than to a man. I don't want a careless man for if a blunder is made, money is lost. We drop one eye about a foot apart, the drills thirty-two or thirty-six inches apart. The larger growing varieties we plant three feet apart. We want them to cover the ground when they are grown. Many people would suppose my potato field was a field of clover. You want to shade the ground all you can.

In this line of reducing the cost of production, there are fifty points I could talk about. For picking them up after digging we use bushel boxes. It took me years to study that out. Nothing has ever helped me so much as a little pencil. When I was in debt, I kept account of everything I remember once I met a farmer when I was hauling a carload of potatoes to the depot. He asked if I could afford to sell for forty cents a bushel. I said, I think so; I don't think I had better hold them, in debt as I am. I said it has cost me thirty-one and a half cents to deliver them on the train and I believe I had better let them slide. He laughed at the idea of figuring to a half cent on potatoes; but that helped me more in diminishing the cost of production than anything else. So I tried one way and another. In planting and cultivating I tried to reduce the cost of production in these different ways. The cost was thirty cents a bushel then and fifteen cents a bushel now.

The boxes are a great help; you can handle them much faster. We often put three hundred bushels in the barn in a day. I do all the digging and the hauling to the barn. I start the digger in the morning and dig four or six rows; then I hitch on to a load of empty boxes and drive to the back end of the field tossing them off as I go and turn around about the time my men get a load picked up; then they set the boxes in the wagon, and I drive to the barn. Then I dig four rows more, then take a load of boxes and bring up another load of potatoes. When we carry to the market early in season we carry in the boxes; but to load on the cars I find it better to use two bushel sacks, putting a bushel in each one, then two men will toss them up as fast as I can load them.

While I am gone to the car a couple of men get more ready and we put a carload upon the track in less than a day. We lessen the cost of production in these ways; it leaves more money in my pocket at the end of the year. There is another point, and that is, selling to the middleman. I don't want the middle man to get more for *looking* at the potatoes than I get by working over them. There is where so many farmers fail in the selling of their crops. I began by selling in a large town of 20,000 inhabitants. Then potatoes from the West were shipped in, every freight was loaded with them and they were sold so low I could not compete with them. After a while I began to look for other markets.

I sent potatoes almost under your noses; I sent a load into Connecticut. Thirteen cents a bushel will put potatoes into any point of the Atlantic coast, from my place. A year ago last fall when potatoes were a dollar a bushel we had a great crop. At the West the top price was forty cents. I furnished families in a little town where New England spindles are run. I have never been hoggish about it; but it is perfectly fair to get a little something for doing business. I have got ten or fifteen cents a bushel more for my potatoes by jumping over the middle man. I sell my wheat in the same way and get about $50 more every year. The farmer must look at all these things. That is the reason why you want to be specialists. You cannot afford to send a little butter to Boston or a single load of potatoes; but if you have eight or ten carloads you can make it pay perhaps; especially if they are a little better than others have. If you have something a little better, you can, with a good face, ask a little more for it than others do; and then you are in the way of making money. Our yield is from 200 to 250 bushels to the acre in ordinary seasons. In some seasons we have had 300 bushels; in poor seasons 150. Two hundred bushels would be a fair average. I think you can, in Maine, grow 300 with the same trouble.

We are troubled with excessive heat. Do our best and sometimes the heat will almost kill the vines. We have ash and beech land where the sub-soil is hard. We have a little land called chestnut land which is easily worked

Ques. How deep do you plow?

Ans. We plow a little deeper than we have plowed before, every time. We plow about eight or nine inches deep, sometimes a little more. Twenty-two years ago our land was not plowed more than five or six inches; we have been gradually deepening the soil. I would not deepen it for corn, but for potatoes I would. Corn roots want to be near the surface; potatoes don't. Potato roots don't run directly down; they branch off sideways. On hard pan soil you won't find any roots lower than sixteen inches from the surface. On ground plowed nine inches deep you will find most of the roots in the lower six inches and very few in the top three inches. Roots of clover and wheat grow down deeper than potatoes on my soil. I have traced wheat roots three or four feet deep.

Ques. Are you talking about the pea vine clover?

Ans. The common clover; we grow common clover because we want the first crop for hay. I am not acquainted with the Alsyke.

Z. A. GILBERT.

Mr. President, Ladies and Gentlemen: I don't want to attempt to supplement the arguments of the afternoon further than in a few words to point a moral. I have seen so many farmers of this idea, that all that talk is good for Ohio, but there is no application *here.* I have been trying, ever since I have been connected with this work, to ding into the ears of farmers, that while we have made some progress, there is room for more. I have proved it in some small measure, and while I cannot say with these gentlemen that I have made money, I *can* say that I have paid my bills; and it has been done by directing my attention in a certain line of effort;—and gentlemen, if there is anything that can lead you out of the wilderness of uncertainty with regard to your prosperity in the future, it is this line of special effort, that leads you to better results. Just count up the farmers represented in this meeting. See what they are doing. Go and select a man who has in a measure drifted into the line of special effort and see if he has not realized more out of it than those who have held to the old fashioned way of doing a little of everything and not much of anything.

If we have this knowledge presented to us, let us with our intelligence accept it and make its application among ourselves. Don't think that clover will manure land in Ohio and won't do it here in Piscataquis county. It is the same in one place as the other. The principle holds good; the application of the specialty holds good. I was glad to hear the remark made that we have markets within our reach. I am afraid we don't appreciate the fact that we have superior facilities in the State of Maine. The gentleman didn't name a high price for potatoes. It was done with what you would call a low price. You have the facilities to produce that crop equal to *his*. Many of you have soil as well adapted to it. Just so with your other lines of work; you have the opportunity to make the application and out of it, reap your reward. But we must get out of these traces we have been so long travelling in. I was glad that he referred to the matter of buying and selling. While the credit system is largely done away with, we do buy too much at retail. We buy with too little effort to secure our purchases at the lowest prices. Isn't it as well to put it into that as to dig it out of the soil. So let us join hands and effort and intelligence and work together to reach these results. Money has as much purchasing power in the hands of one man as another. If you have the article a man wants he will not slight it when it is offered to him. So out of these ideas that have been presented here, you can, if you will, reap a reward. It remains with you to see whether you will do it or not.

SHEEP HUSBANDRY.

By C. M. Winslow, Brandon, Vermont.

Mr. Chairman, Ladies and Gentlemen: Our friend from Ohio has told us about special farming. I am to say a word about my experience and will do so before taking up my theme. My farm is entirely in grass. I raise nothing but grass. That grass I feed to horses, cattle and sheep. I don't know whether you would call that special farming or not, but I push that thing for all it is worth and I have made money at it. A number of years ago I bought a flock of sheep; I bought a few registered cattle. Since then I bought a few horses. I sold my sheep the other day, because a man wanted them more than I did. I am looking for another flock. I have fifty horses, thirty registered cattle. My farm is somewhat rocky; it is a limestone soil and intervale meadow. My cattle run in the pasture in summer. I mow my meadows and top dress them. I let the cows on after mowing, but not the sheep or horses. I believe in that line of special farming if you can work up a reputation and make a market so you can make money; if you can lessen the cost of production so you can sell cheaper than your neighbor.

You can make money by your brains if you can produce a cow or horse or sheep at a less price than your neighbor can; you can undersell him if you are a good salesman to put that animal upon the market. You made a profit by lessening the cost of production and you make an extra profit by selling for more than your neighbor does. That comes in the line of special farming. I judge that our friend from Ohio is a Yankee at selling. He can produce well and is skillful in disposing of his product. I think we farmers fail in selling the product of our labor. We don't take the pains we ought to put it in presentable shape to get a large price. He says his potatoes are all sorted; the buyer knows when he looks at a sample that he can depend upon having a thousand bushels that will run in that same way. Suppose you have lambs to sell. Are you willing to pick up a lamb, take it to Boston and tell a man you will supply him with a hundred lambs like that? But they are not all alike and when you sell unassorted stock you give away a good portion. If you have a dozen lambs in your flock that are a little off, are not they worth something to you? You give them to the butcher when you mix them among your good ones. There is where the lack of good judgment comes in. The buyer says, "If I had fifty lambs like these, I could take them to any of the markets and get a good price; but the others I can work off." He buys of you and you throw in the dozen poor ones. He gets enough more for the others, and sells the poorer ones for what he can get.

I am asked to say a few words to you to-day on the subject of sheep, and am selected for this purpose I suppose because I live in a state where the keeping of sheep has made many farmers rich in the days gone by.

My father was a keeper of sheep and I have attended them from a boy but I cannot say I have grown rich as yet but I flatter myself I am still a young man and the tide may turn and waft to my feet the golden fleece ere many years more have passed over my head.

Sheep business under the old system had very different surroundings than we find to-day and needs different management to render it profitable. Wool was high with a continued short supply and an increasing demand. The new countries were opening up for sheep ranches and both sheep and wool were in demand far beyond the cost of production which of course gave to all who engaged in the business a large or small profit according to their skill and judgment displayed in the business and no one lost by it, but times have changed even in Vermont and the general complaint among the fine wool raisers now is that it does not pay either to raise sheep or wool, and the wise ones are trimming their sails to the shifting winds and still go on with the time honored and profitable business of keeping sheep, but regulated to the new order of things and the demands of the public.

The sheep grower of to-day finds a strong competitor in the cheap lands of Australia and South Africa as well as South America and those of the southwest of our own country if he wishes to keep sheep for wool alone, and he is driven out of the business by that relentless foe, cheap production, but there opens to him another branch of sheep husbandry which will pay, and which I believe is destined to be a large factor in the food supply of our cities and towns.

I refer to the production of mutton and lamb, and I appeal to the memory of the older here before me and ask if you cannot remember when mutton was scarcely seen in the markets and hardly ever on the bill of fare at even our best hotels, and lamb never. Yes, of course you remember it, but go with me to any first-class or even respectable hotel to-day and I am sure you can scarcely pick up a bill of fare that does not include both mutton and lamb in its varied forms. Why is this change? Two conditions have brought it about I believe. The public have demanded a greater variety of food and the farmer has developed a better quality of mutton, hence the new industry and one liable to increase to large proportions.

There is no meat that comes on the table that is so healthy as mutton, no meat that is so cheaply raised, none that can be served in so many varieties of styles that are attractive and toothsome. It is for the farmer to cultivate all this and turn it to his advantage by the production of a quality of mutton that will foster the demand.

There are advantages in the keeping of sheep that should not be overlooked when the farmer reckons up his accounts for if he would keep an account of the outgo as against the income and compare it with any other class of stock on the farm I am sure he would be surprised

Nearly all the work in the care of sheep comes at times when the farmer's time is of little value, for it is during the daytime of winter and spring and is all out of the way when the busy work of the farm comes on while with the cows the work of milking and care of milk must be done every day all summer long no matter how driving is the hoeing or haying.

I would not advise every farmer to engage in the keeping of sheep for he may not be fitted by nature for that business, and if he is not he will never succeed. To be successful a man must love sheep, he must take to them and they must take to him, there must be a mutual feeling of confidence and friendship between them for if he does not love the stock he has the care of they will not thrive nearly so well for there are many little attentions they will miss and he will not be quick to notice if anything is the matter with any of them. I like to see a man stop and watch his flock a while after he has cared for them or lean over the fence and look at them for it shows he has more interest in them than simply to throw them their food and run to a more genial occupation.

If a man who naturally loves sheep wishes to engage in the business of raising them he should look over his farm and see if it is adapted to successful sheep husbandry. Sheep like a dry soil and if rocky it is no disadvantage but the feed should be sweet and plentiful and of a fine quality for they do not like rank or coarse grass. He should examine his market, both as to its distance and demands and regulate his production accordingly. If he is near a large market he can do well to raise early lambs and the earlier and the better they are the higher price he will receive. If he is removed far from market it may be wiser to have his lambs drop later and either sell for summer lambs or keep until fall and feed for winter selling. Each plan has its advantages for if they are to be kept over they need not drop so early and that will make their cost considerably less and will also insure a larger percentage of lambs for they can drop just as grass starts and the ewes will not have required so high feed nor expensive quarters, then too it is milder and the lambs are almost sure to live and do well from the start.

The selection of breeding ewes is very important, aside from the breed chosen and the points to guide are very different in selecting sheep for raising wool from those intended to raise mutton and lambs, but as the industry of this section is devoted almost entirely to the raising of mutton I will confine myself to that class of sheep.

There are many breeds of mutton sheep of greater or less excellence, and adapted to certain conditions and localities. My opinion is that for this climate some of the Downs are more to be desired, particularly on account of their fleece which is better adapted to resist the cold and wet than the more open wooled breeds. The Southdown is a nice little sheep and produces a fine quality of mutton but their wool is short and thin and the general market will not pay any more for their mutton per pound than for a larger and poorer quality of meat, so I believe it pays better to produce mutton from a larger class of the Downs even if it is not of so good quality. Whatever breed or class you choose should be decided by yourself but the individuals that start your flock should be the best of their kind. A sheep well wooled, of a quiet disposition and large body, broad and flat on the shoulder, with large lung power and short, strong legs is likely to be a profitable sheep.

Ques. When do you prefer to have your lambs come?

Ans. Any time after the first of April, or about early grass, as I think all in all I make more than to try to raise them for extra early selling. Let me say a word in regard to selling stock. A good many farmers are good producers but poor salesmen, as they neither know how to display their stock to attract buyers nor when to sell. If you fit your stock ever so well there will be one or two that have not done well and are not as good as the others, and farmers often make a mistake by trying to shove in one or two poor animals into an otherwise prime lot. It is a mistake, for the buyer will surely see them and you cannot make him see any others, and if you sell to him he will in fact make you throw the poor ones in and will not then be as well satisfied as he would have been to paid just as much for a prime lot of less number. Make your flock for sale attractive by sorting and putting them into even lots, watch the market and when ready then sell for as high a price as possible.

Ques. How many sheep would you keep in a flock?

Ans. That depends on the breed. Merinos will do well in flocks of several hundred, but the mutton breeds will do best in small flocks from ten to one hundred, and the smaller the flock the better they will do.

Ques. How about keeping sheep in the same pasture for a number of years?

Ans. I think they do well if the pasture is naturally adapted to them and the right number of sheep in the pasture. Sheep need sweet grass, and do better on rather a short bite.

Ques. Is there any difference between the Southdown, the Hampshire and Oxford?

Ans. The Southdown is a small compact sheep with a short fleece and a light shearer, but the mutton is of superior quality and very heavy for its size. The Hampshire is the largest of the Downs but the Shropshire is just now the most popular. But I do not know that they are any more desirable sheep than the Hampshire or Oxford.

Ques. Do you call the Shropshire a hardy sheep?

Ans. I think they are. I never owned any Shropshires, but I am told by those who own them that they are a superior breed.

Ques. Will the fertility of the farm be kept up by keeping sheep?

Ans. No stock that is not fed grain will keep up the fertility for a little is taken away every year that is not returned unless some extra food is given them. I think sheep will take as little as any stock.

Ques. What kind of hay do you prefer?

Ans. Rather fine hay, and give them a variety if possible.

REMARKS ON SHEEP HUSBANDRY.

By J. L. GERRISH, Contocook, N. H.

Ladies and Gentlemen: Your secretary asked me if I would say something on this question to-night. I have had a good time listening to the brother from Vermont. I didn't know what he was going to leave for me to say. He seems to have had the good fortune to have been born in a sheep state and has been a close observer and good breeder of sheep, cattle and horses, and if I should attempt to say anything on this subject, I should feel that I would not have time to say all I could about sheep, from the fact that the very first business that I recollect of doing, in a responsible way, was the care of a flock of forty sheep for the winter. I was a small boy; as small as any one, except two, in this audience; I couldn't have been more than eight years old. I had to feed that flock of sheep. As I look back, it is one of the first things I remember of doing in the way of farm work and if I hadn't been born a sheep man, it would have taken the sheep all out of me.

I am a good deal interested in cross breeding. I have some dear bought experience; it has cost me a good deal of money and time, of which no man likes to speak; I could tell you more than I want to, which is true with a good many speakers on agricultural matters. I have had abundant opportunities to travel in New Hampshire, Vermont and Massachusetts, and a little in your State, and mingled with those who have had experience in cross breeding. I have got a good deal of the experience of other men. I have found plenty of men in just the fix that the gentleman has asked you to think of to-night. This crossing as he tells you, of coarse and fine. For one cross, they get very desirable sheep. Many a man has shown me his flock with pride, and then asked, "What shall I do next?" I think the gentleman will say that men have got very fine flocks by crossing the coarse and fine. I presume many of you have had experience in this line. I certainly could point to a dozen men in my State. A mar asked me the same question to-day.

We find that the nobility in England have kept these large breeds of sheep. They have plenty of money and time to look around them for the renewal of flocks. Notwithstanding all this, Bakewell says the tendency has been to reduce the vitality of large breeds of sheep even in their own country.

I once met a Scotchman, one of five or six sons, raised as a shepherd. They were all shepherds, born and educated to the work. He said that in Scotland his father and uncles told him that they were unable to use more than three-fourths of those large breeds; they had introduced Highland sheep, or Down sheep. They may be kept up on a gentleman's farm with high feed; but for the ordinary farmers who pay high rents have not been successful. There is where the breed of Shropshire originated. They were called rent payers; and thus came to be known as Shropshires.

Tenants had to run their flocks on the basis of money; and they could do it quicker with these as they are obliged to produce full blood on the male side in England and France. The different location and taste of individuals in France, established fifteen breeds of sheep, varying with the character of the soil, location and market. We find in Great Britain as many as twenty breeds of sheep that have grown out of the fancy of the breeder.

As has been told you by this gentleman, you will find the Cotswold on low ground and the Merino on the hill. It is a matter of breed. It is even supposed that the Merino sheep existed before the Christian era. If France has fifteen and Great Britain twenty breeds; are not we to have American breeds? We are a young people. We find English sheep will not do as well in New Hampshire unless bred there. It has been proved to me by sad experience,—which many can relate,—that heavy, large breeds of English sheep do not do as well in New Hampshire, though they might here. If we cannot do well with the sheep that are bred in England, and if we have done well with cross breeds, it is a question whether it wouldn't be wise to continue to cross in America and establish breeds of our own.

I will give you the experience of Mons. Noel, Director of Agricultural Experiment Station in France. He liked the cross between the coarse and fine breeds and so tried crossing. He found he had sheep, pretty to look at but small in size. They grew more beautiful, but beautifully small. That has been the experience of those who have tried inter-breeding. This Frenchman made a study of it and what did he do? He failed as Vermont men and other men in New Hampshire have. We have breeds of pretty good mutton sheep, pretty good wool sheep. How shall we hold them?

The time, I think is coming, when we should be thinking about establishing American breeds of sheep. There is money, knowledge and material enough here, if put into right hands, to establish acclimated breeds of sheep that shall meet the particular wants of our several localities.

FARMERS' INSTITUTE AT EXETER MILLS, OCTOBER 29, 1891.

RAISING CORN FOR THE SILO.

By THOMAS DAGGETT.

Mr. President, Ladies and Gentlemen: I hardly know what I am expected to say here this afternoon. I do not see that my name appears on the programme for this afternoon, but I have been unexpectedly called upon to say something about corn for the silo with which I have had some experience. An audience of this kind, coming together from the fertile country of the western part of Penobscot county, understands as well as any, the best methods of raising the corn crop. There is no crop raised upon the farm of more value than corn. I am not going into details about fitting the ground; you understand that as well as I do. The matter of expense of corn I have carefully considered, kept the figures, and those figures I am prepared to give you to-day. The cost of raising and the manner in which I have disposed of it may seem unreasonable to some but it is simply the plain story of my experience.

I have charged a certain amount of the dressing which I applied, to the crop of corn. I may have applied too much; I may not have applied enough. It represents, what, in my judgment, went to this one crop. That is about one-third; and if I were to say what I positively think in respect to the matter, I should say I don't think it consumed one-third of the amount of dressing. Then I have charged the whole amount of commercial fertilizer to the corn crop which is perhaps not entirely just. My figures are, cost per acre for plowing, three dollars; harrowing, two dollars; planting, one dollar; hoeing, three dollars; harvesting, six dollars; seed, seventy-five cents. The item of seed may seem large; in my method of planting and taking care of the crop it requires a little more seed than it would otherwise, or for using corn for other purposes. I want from twelve to fourteen quarts to the acre and good seed corn costs pretty high.

What I use is common field corn; yellow, eight rowed corn. I am not going to say this is the best kind; but the best I have tried, and I am satisfied. It is a large variety, perhaps rather a late variety. It was common eight rowed, yellow field corn. The manure I called ten dollars; I regard that as about one-third the value of it. I charged that to the crop of corn. The application, drawing from the barn and spreading, eight dollars. With the improved implements it would have been done more cheaply. Superphosphate, six dollars and seventy-five cents. I put on four hundred and fifty pounds to the acre. The total cost of raising that acre of corn was forty dollars and fifty cents. Now then comes in a very important point with us as farmers. Now what shall we do with this crop of corn? There is no difficulty in filling our barns with hay and grain, our cellars with potatoes and the corn crib with corn, but what shall we do with this crop after we have raised it?

That's the question for us to consider. My method of taking care of that corn and of using it, is this: I put into a silo and feed in the form of ensilage. It is the best way I can use it. Others may have better methods of taking care of their corn crop but that is the best I can do. Now upon an acre, after dressing and taking care of it in this way, under ordinary circumstances, ordinary conditions, in nine years out of ten, you can raise fifteen tons of corn and fodder. That would be regarded an average crop. Of the larger varieties of corn, sweet corn or western corn you would raise twenty or twenty-five tons to the acre; but I don't think it is as valuable as this. This gives thirty thousand pounds of fodder on that one acre of land. I have disposed of it in this way because it is a practical way; a way in which I get practical and satisfactory returns. Having it in the silo the question is to feed to get the best returns. That amount of feed (fifteen tons), given with three tons and one thousand two hundred pounds of hay, (at the rate of six pounds of hay per day), will feed six cows two hundred days, from the first of November to the twentieth of May.

Now then, the cost of keeping six cows on this amount of hay and ensilage, when hay is worth ten dollars a ton,—which is a fair price,

—for two hundred days is seventy-five dollars and fifty cents. The cost of keeping one cow, twelve dollars and seventy-five cents. That is the method I have adopted of raising corn and the method of disposing of my corn crop.

Ques. You have reckoned a small measure of grain feed?

Ans. I have not, from the fact that it depends upon circumstances; whether you are feeding cows that are dry or those giving a full flow of milk. To those fresh in milk I should feed a small amount of grain, but I shouldn't feed much grain with that fodder. It is sprinkled thickly with sound, yellow corn. I cut it when it first commences to glaze. I silo the ears and all. I cut it into half inch pieces. If your cows give a full flow of milk, I should give them two quarts of bran and one quart of cotton seed meal a day, each, without any corn meal. If they were not giving milk, they wouldn't require a grain ration, nor hay. A feed of straw would be enough for them with the ensilage. Perhaps it would be well to give them a little bran, though I never have given mine any.

Ques. How many pounds of ensilage will they eat?

Ans. I have reckoned twenty-five pounds per day for a cow.

Ques. How much of this corn did you raise?

Ans. I raised this year, ten acres, and I put into the silo eight and a quarter acres. I should have put all in, if I could. The other I fed to my cows dry.

Ques. How long have you used the silo?

Ans. Three years.

Ques. These figures are the result of the whole three years?

Ans. No; they are the result of the first and third year's experiments. The second year, I was led to believe that there was some other kind of corn that could be planted and raised as well and get a better and larger crop, get more nutrition from the same amount of ground. I wasn't led astray by the Board of Agriculture however; it has always advised the planting of yellow corn or corn that will mature for the silo instead of any other. Unfortunately I took the advice of some one else and planted a variety of large sweet corn. I presume I put as many pounds into the silo but it wasn't as good corn for feeding purposes.

Ques. How did you apply the fertilizer?

Ans. I drilled with a machine at the time the corn was planted. I plant with a machine; I couldn't plant for a dollar an acre, unless I did. I plant in drills because I think I can get a little more fodder on the same amount of ground.

Ques. What space between the kernels?

Ans. From four to six inches between the kernels, one kernel in a place. I don't cut it, in the field, with a machine. I might cut it down with less expense, but the difficulty would be in gathering it up; we want to keep it straight to put into the cart and carry to the barn, so it will go through the machine all straight and with very much less trouble.

Ques. Did you ever try the reaper?

Ans. No. I believe there is a machine that cuts, binds and shocks the corn; but I haven't it. I have men cut the corn and lay it down in small armfuls then lay it carefully into the cart and draw it to the barn and lay it as straight as possible and keep it going from the cutting in the field until it is in the silo. I put from thirty to sixty tons a day into the silo.

Ques. Do you know the difference between the cost of wintering a cow on ensilage and the ordinary way of feeding hay?

Ans. Yes. It agrees almost exactly with the statement of Secretary Gilbert to-day; that it costs fifty dollars to keep a cow. I can keep mine for twenty-five dollars in my way. That is my practical experience; and what is my experience, it seems to me could be the experience of every farmer in this county and my county.

Ques. In raising corn for the silo, if you apply the manure what are you going to do for other crops?

Ans. Next spring or this fall I plow the ground and sow it to grain and rotate. I don't want to carry on mixed farming. I want to raise beans and potatoes enough for my family and the rest is corn crop. I make it a specialty. I can raise more value on an acre than of any other grain crop.

Ques. Do you do hand work in the crop?

Ans. I don't; I oblige the cultivator to do all the work; we hoe with horse power. There is no hand work except cutting the corn. It is not necessary to cut the corn for the silo; I do it for several reasons. I can pack it closer; it will keep better; the more you exclude the air the better feed you have, and it is better to feed cut than in the whole stalk. My cattle don't like the large stalks.

Ques. How much can your machine cut in a day?

Ans. From thirty to sixty tons. It requires quite a force to keep the machine running all the time. The capacity of the machine is from thirty to sixty tons; that includes the elevation and packing it in the silo. I make an effort to put it into the silo all at once, not because I think it will keep better, but I am in a hurry to get through It is necessary to put it in when it is about right. It should be put in in the course of ten days from the time it is ready. Ten days should be the extreme. One reason why I cut it up, it is more convenient to feed; then it will preserve better. There is no difficulty in preserving it if you can exclude the air. You can have better feed by treading it in solid. If cut coarse there will be vacant spaces; this vacuum of air will injure the fodder. You can fill up closer with fine cutting.

Ques. Is it necessary to have corn fodder dry?

Ans. It is better to handle when free from water. The more water you put in, the more you feed to the stock. It is as well with the water as without it; but it is wet work to handle it.

There is one advantage right here in connection with this ensilage over the old method of husking it; and that is, you don't have to wait for the weather. You can put corn fodder in the barn as soon as it stops raining. If you have to dry it, you have to wait until it is perfectly dry before getting it in.. I never put away my corn fodder without getting it mouldy. In this way, there is no mouldy fodder; it is good and sweet; palatable for the cattle.

Ques. In what condition does it come out of the silo?

Ans. In the same condition in which it goes in. It changes in color slightly, heats and becomes a little acid.

Ques. Doesn't it soften?

Ans. The kernel, if hard, does soften; I don't know as the fodder does. Another advantage is, that you have all that feed to give your stock In the old way you raise corn for certain purposes. When fed to stock you have to carry it to the mill to be ground and after you get it to the mill you pay for grinding. A large per cent of the corn crop does not go to your stock. It costs, to put in the bin in the old way, double what it costs me. You know the cost of cutting, shocking and husking your corn. You know you cannot begin to do it for six dollars an acre; and I certainly put mine into the silo for that. I know what it costs to a cent.

Ques. What weight do you put upon your silo?

Ans. I don't put any particular stress upon the weight. After I get my silo filled, I put on a good layer of straw or meadow hay; —something comparatively worthless for feeding purposes,—perhaps a foot thick; then a layer of boards to keep the straw down, all packed smooth with a slight weight upon the top;—wood junks;

probably not more than a ton's weight on mine. I put on about a foot of straw after treading down. If you put on too much, the under part will be poor and the upper part good. It is economy to have something on top of it to absorb the moisture.

Ques. Most of us are raising sweet corn for the factory. What shall we do with the fodder?

Ans. I should put it into the silo. If your stock will eat the corn stalks all up after the corn is picked, perhaps it is not necessary to put it into silo.

Ques. Why do you say you should plant yellow corn instead of sweet corn?

Ans. I am giving my experience. If I had a factory near, I might plant sweet corn and sell to the factory. I know I am safe as far as my experience goes, that no variety of corn that I have raised equals the common yellow field. I said others might do better than I have,—but that is the best I can do under the circumstances. That is my experience. I am not dictating to you what you shall raise. I don't know as the Board ought to be held responsible for my planting any kind of corn. The Board of Agriculture has advised a safe course. It is safe to plant yellow corn. Now if there is anything further with regard to this silo that you care to have me talk about, you can ask about it.

Ques. Have you given attention to the statement that the milk of cows fed on ensilage is not as good? That those who put up condensed milk, reject it entirely?

Ans. I don't know about that. I never sold milk to factories for condensing purposes. I know I had a friend call upon me while my cows were eating ensilage. He never had tasted the milk of ensilage fed cows before, but he could not detect any difference or any odd flavor in the milk or butter. Any sudden change in the feed of cows, will affect the flavor of the milk; I have no doubt of that. I don't go to great expense in making a silo bin. I place timbers reasonably near together so there is no settling between them, and put down a layer of boards and sheathing paper, then another layer of boards. That is the way I build the bottom as well as the sides. Practically, it is air tight in that way.

Ques. Are you troubled with your ensilage freezing?

Ans. No. If there was an exposed place, it might freeze; but inside it is always hot. It is warm all the time. It don't injure anything if it remains warm.

Ques. If you have the kind of soil that you reach hard pan at the bottom of your cellar, would you put in a board bottom?

Ans. If you strike hard pan, make the edges perfectly tight; that would be just as good. I contemplate building another and putting in a concrete bottom. That might be more expensive.

Ques. How large a silo does it require for fifteen tons?

Ans. It is estimated that one cubic foot contains fifty pounds of ensilage; so a silo twelve feet square and seventeen or eighteen feet deep would hold about sixty or sixty-five tons. A silo needn't cost over fifty cents for every ton. That is on the basis that it is built in one end of the bay of the barn. This cost of silo has been a great objection; some thought they couldn't afford it. Some thought they could preserve the fodder more cheaply in some other way.

I received a letter a year and a half ago from a gentleman in Hallowell who had heard that I was interested in silos, and he asked me the question whether he could afford to build one or not, and the cost of it. He told me the amount of stock he kept, and that at one time he contemplated building a silo, but met the late Governor Bodwell and asked him about it,—if they were profitable, and the Governor told him he didn't know anything about silos. He didn't know anything about farming, personally; but he referred him to the superintendent on his farm. He saw the superintendent and asked him about it, and he told him they would do for a rich man, but never would do for a poor man; he couldn't afford it. I told him I should say it would do for a poor man, but a rich man could feed on anything he pleased; on meal or hay regardless of cost; but a poor man had to economize. Governor Bodwell had one that cost $1,500. A poor man couldn't build such an one; but he can one that costs him only $30 or $35.

I should be careful in building a silo, to have it thoroughly timbered. There is a great strain. Mr. Bean built one and the side of his barn came out. Sixty or sixty-five tons is a great strain upon the side of a barn. I put iron rods across my barn. It was well stayed and stands. After taking that precaution, I should board the inside with planed boards. I don't think it matters whether the boards run up and down or crosswise, but I should have them planed on the inside so the ensilage would settle more evenly. The only object I could have in making these suggestions is, the time has come when we must try to lessen the cost of production. That is one thing for the farmer to do. That is one question we have to solve. The time is past for high prices or large profits; mutton, wool, horses, beef and dairy products are low and we must now consider the question of production. If my neighbor produces his butter for fifteen cents a pound and sells for sixteen, there is a profit. If it costs me seventeen cents, I am producing an article at a loss. It is for me to consider and produce that article as cheaply as he does. When we have reduced this cost of production to the lowest possible figure, we have solved the problem of whether farming will pay or not. There is no question about that

Ques. What is the cost of the machine for cutting and elevating?

Ans. The cost varies with the size. The first machine I had was small; it cost $75 at the factory. I found that wasn't large enough to do the business; I wanted one of larger capacity for this season. I bought one nearly twice as large. It took as many men to cut and haul; as many horses to run the cutter; it required as many in the silo to tread it down. It took only one more man to handle the machine of larger capacity than the smaller; consequently it was economy for me to sell my old machine and buy a new one that cost me $110.

MR. J. L. GERRISH.

Mr. President, Ladies and Gentlemen: I don't like to stand up for any one breed of cattle over another, particularly in my own State; as I am Secretary of the Dairymen's Association I am supposed to be a fair minded man.

I have the impression that there are some of you who make butter and cheese, and some retail milk. I regard those farmers who can retail milk as the best situated of any, except those who take summer boarders. But I don't suppose you want to consider the matter from that standpoint. Of course, if you can retail your milk for six, seven or eight cents a quart, you want heavy milking cows; you have already settled that question in your minds; but talking from the butter and cheese standpoint, you wouldn't want the same breed of cows for cheese as for butter; and perhaps you have also settled that point. We have here with us an Ayrshire breeder from Vermont who thinks he has the best little cow for making milk to retail, or for cheese. I presume he is right in his opinion. We have in the New England States, men who keep the larger cows, the Holstein, but they are too large and too coarse for my State where the soil is lighter and poorer than with you. I haven't had experience with any of the breeds and don't know whether they will produce more milk according to weight and food, than the Ayrshire. Either a good Holstein or Ayrshire is a good producer; but when you come to the butter standpoint, you have another thing. I have been retailing butter for thirty cents a pound to those who don't want coloring matter or any other foreign substance in their butter.

You must have a very good native cow, a Devon or Jersey cow to make butter without artificial coloring the year round. I am willing to be converted at any time about these things; if a man shows me that I am wrong I don't think it looks well to be so set that we cannot change our minds. We shouldn't deride a man who changes his mind when he is wrong.

You want to go at your business with the kind of animal and breed that will make what you want to make. A registered animal is nothing, only as it gives you greater possibilities of producing the same thing again.

A register is nothing, any further than it gives you additional proof of the probabilities of what that animal will do in reproduction. There was an idea when breeding fine wooled sheep, that if a sheep was registered it must be a fine, valuable sheep; but we have got away from that.

The same idea has been entertained in many places with regard to Jersey stock; but there have been a great many poor Jerseys put upon the market. With all breeds of cattle and sheep. a great many live and go upon the market and into business that never ought to be there; and the quicker we convert them into beef or mutton, the better.

I don't know what to do with horses. I don't believe in putting them into the jockey's hands. We have lots of colts come upon the docket, that must have very little value; they are not large enough for work horses, not fast enough for trotters, and not stylish enough for gentlemen's horses. The sooner our farmers let alone raising them the better.

You wouldn't think of going into a scrub race with the Norman Percheron any more than you would to go into the dairy business with a cow no better adapted to the dairy. If we have done that it is because we didn't know any better. We want a cow that is made for the desired business. They want to be well bred and fed for that purpose. If we want a general purpose cow, or a sheep that will make mutton and wool, you cannot expect to get the extreme mutton or extreme wool. It is the same with cattle and horses. The general purpose animal has had its day.

There may be a man who wants a cow for family use;—there's the place for the general purpose cow; the dairyman don't want it. If he wants a Jersey or Guernsey he wants one that will respond to feed; give him good milk, and not one to convert the food into flesh, thus diverting it from its proper channel and making an animal fit for the butcher rather than to be continued in the dairy.

Mr. GILBERT. We have more than filled the programme, yet I wish to say, that in making it up, the programme for these meetings, after having taxed my own resources to their extreme limit, I sometimes speak to the local grange, to find what they would prefer for consideration on these occasions. Among other suggestions in connection with this institute was this: "How can we increase the resources of our farms?" That wasn't inserted in the programme yet if you should study between the lines you will see the relation between the work we have been doing to-day and this important question to the farmers in this vicinity as well as every other. We have tried to indicate to you something of what was within your reach in connection with our dairy interests, so that if any of you should see fit, or if the remarks made in that direction commend themselves to your attention, that you may receive some hints in that connection and carry them home and put them into practice as your good judgment shall lead, and increase the resources of your farms thereby.

This afternoon, our friend from Ohio, indicated to you something of the advantages of special effort in special directions. He illustrated it by his own experience, the best instructor we have, in farm practice. This evening, he has kindly come to the aid of the women who have assembled here and listened so patiently to our deliberations in other directions. He has happily shown them how they they can increase their resources by getting into the good graces of their husbands. Our friend from Vermont has told you how you can increase your resources in sheep husbandry by the diligent attention that goes with business success in other farming operations.

We don't say to you all, go to dairying; we don't say to you all, go into sheep husbandry; but if the profits that lie back of these, recommend and appeal to your good judgment, you may take these matters home and with your intelligence, study them and see if there is not something in these that will lead you, in a measure, greater or less, to realize more out of the farms than you are now securing. And with these lessons as we have presented them, we leave the subject to your further consideration; but with the knowledge on your part, of course, that it depends upon your efforts whether or not you will increase the resources of your farms. There must be a purpose to carry out; and the more of intelligence we put with that effort, the greater the success will be. You must give diligent attention to business and have confidence in the business you have selected. When this is done, men in the possession of farms like these, we believe will be found to reap a reward in proportion to the investment in business.

Thanking you for the attention you have given us and the hospitality we have received, we leave our efforts here for what they are worth, hoping they may bring forth good fruit.

FARMERS' INSTITUTE HELD AT ALBION, OCTOBER 31, 1891.

THE CULTIVATION OF SMALL FRUITS ON THE FARM.

By T. B. TERRY, Hudson, Ohio.

FRIDAY, A. M.

Mr. Chairman, Ladies and Gentlemen: We get a great deal of pleasure out of farm, from a small tract of land. We make money out out of farming and get lots of comfort and luxury from about an acre of ground—it is about that I am going to talk this morning—where we raise different kinds of small fruit for our own use. I will tell you just how I would set out a fruit garden of that kind if I were intending to start next spring; tell you a perfectly simple way to grow an abundance of such things for your own use and grow the best. Of course there are a great many ways; the specialist may go further than those who grow for their own use.

The strawberry is the first fruit we have, and lasts about three weeks. We have them on the table every meal, eat them by the bushel; no matter *what* they are worth in the market. We can afford to have something nice to eat; it don't matter how much it costs, we don't care. There was not a meal for seventy-six meals that we did not have nice strawberries last year I ate all I wanted. As soon as the strawberries were gone the red and black raspberries came; one laps upon the other. We have all of them we can eat for three or four weeks.

Then the blackberries came. We leave them on the vines as long as we can. They sometimes last five weeks. We have small fruit for three months, and we get lots of enjoyment out of them, so do the children. I like to have them see them grow, take care of them sometimes, know something about them. It does them good; and the hired man liked them also; I never knew the hired man to leave a dish full. A year ago last spring a man came to work for us from a planing mill in New York. He wrote me he had been in the city some time and wanted to get out on a farm. I thought I would give him a chance and he came and worked during the season and I paid him a good, fair price, treated him well and gave him all the berries he wanted, and at the end of the season he thought he would go back to the city. He didn't say anything about coming back the next year. I asked him if he wanted to and he said he would think about it. It wasn't but a short time before he wrote and told me he would come. I think the fruit had something to do with it. That was something he couldn't get in the city; one-third of his wages would not buy in the city what he had received free.

I like berries and like to have my family have them. We all work hard and there is no reason why we shouldn't have the luxuries of life. Our pastor once came to our house to take tea. We had a great, heaping dish of red raspberries setting beside each plate. He says, "These are luxuries with us but seem to be articles of common use with you." That man with a salary of $1,200 a year couldn't afford to have them all the time; but we farmers can afford it. It is one of the luxuries that pertain to the farm, and the farmer isn't more than half living who don't think of this and put his thought into practice. I wish I had known this the first part of my life. I would have a fruit garden again the first thing I did; and I will tell you how you can take care of one easily. You cannot afford to fuss much;—I have all I can do with my field work, but I do manage to grow these without much cost.

If I were intending to set out an acre next spring, which is not much more than we want, (I like to give them away when one of those close farmers come to me, who thinks he cannot afford to have any. I like to give him a peck of great, big strawberries about as large as that apple, four and one-half or five inches around. I always think I may do a little missionary work; that he might get a taste of some so he might go and do likewise. I have given farmers plants to get them started if I had too many. I can give them away if I don't want to sell them.)

I would arrange it in this way: We have no manure to spare; we want that for the fields. I would manage the fruit garden so as to avoid the need of a large amount of manure. I would use clover in rotation as I would in potatoes. I have grown a hundred bushels of strawberries on half an acre fertilized with clover. I have done that with clover, for it brings me potatoes and berries. I have strips like this (explained from diagram, one acre divided into equal sections). I put strawberries four feet apart; I would set out a new bed every spring. It is less work for me; and then plow the old one after picking. It is less work to set out a new bed than to clean out the old and you get better berries. New plants are best. You set them every spring and have the best plants. You keep the stock in the highest condition and it is but little work to set them out and keep them clean. It is no trouble to take a rake and scratch the surface to prevent the weeds from growing. That's the whole secret of strawberry culture. Here is a bed we set last spring. Next spring here is another bed to be set (referred to diagram). Here is a strip of clover; here vegetables. We shall set out strawberries on this strip where the vegetables are next spring and plow in the old bed of strawberries and sow to clover; keeping the fruit garden on the same piece of ground for a number of years.

The other small fruits, I don't know whether you can grow here successfully or not; but I think you can all the rest. This is just the preparation we make for our family use. We have our row of currants in the patch; that must be about fifteen rods long. One row gives us all the currants we can use and some to give away. There are two rows of Black caps; we have three or four varieties, early, medium and late ones. I don't know which variety would do best with you. We have the Hilborn for medium and Gregg for late; so we have them at different seasons. Then there is a purple berry that does well almost everywhere; good for family use but not fit for the market; but we have none we like better. It is the Shaffer. We have two rows of blackberries.

Grapes we have given up because we could buy them easier than we could raise them. I let the specialist grow the grapes. That is the way we grow fruit for our own use, for seven or eight persons. Sometimes we have sold some to get rid of them. Last year we had thirty-five bushels of raspberries, blackberries, etc., and we didn't sell but two or three bushels. They lasted eight or nine weeks and we managed to eat the most of them. They furnished us with lots of good living during the winter. A farmer on Lake Shore came to my place a year ago last fall and asked if we had any raspberries that year. I told him we had an abundance. He said he didn't have any, they all dried up. I had noticed from the car window that they were a mass of June grass; good pasture. Berries don't grow in that way; they never give satisfaction. Our berries are clean; there isn't a peck of weeds in the whole patch. The way we do it is this; every spring as soon as vegetation has started, we haul out wheat straw and cover the ground all over between the rows a foot deep, I don't know but knee deep when loose at first. We pitch it in until we cover the ground and smother all the weeds. In the course of the summer it gets trodden down and towards fall a few weeds start. Then the next spring give another dose.

We haven't had any trouble from mice from putting straw on in the spring. By fall the straw has partially decayed and I think the mice will not get in. I shouldn't dare to put straw on in the fall. (Referred to diagram.)

These blackberries are as they looked the 25th of November last. I had photographs taken and the artist drew them from the photographs. That is about all we do to them,—put on straw in the spring. It is only a few hours work. After harvest when we have a day to spare, we cut out the old canes. I take an old file, get the blacksmith to turn it around, sharpen the hook, attach to a handle and go around and cut off the old canes and carry them out. They have knife hooks, but this don't cost much and we don't need to buy one. Perhaps we spend a day's work in cutting these out in this way; then in the spring as soon as the buds get started, we run through with the pruning shears and cut them out like a nicely trimmed hedge. Raspberries lap over so we cut them back to get room to go through. You will have just as much fruit and nicer from cutting back.

Ques. Do you cultivate or fertilize in the spring?

Ans. No. We have done these three things—put on straw, cut out the old canes and then in the spring trim back. There is one thing more. When the new canes start and get about knee high, we go through and pinch them off once; that's all we do. I kept an account of the labor on the blackberries and raspberries last summer; it didn't exceed $5; and they could have been sold in our market that year for $140. Four dollars a bushel.

Ques. That mulch fertilizes?

Ans. It does. The soil we put them on was heavy clover sod; that is all that is necessary; furnishing it in the natural way. With us the finest wild berries you find, are where the leaves have covered the surface. Blackberries thrive under these conditions. I have known men to set out blackberries and give them great care in the way of tillage and have but little fruit from them. They don't need great care. We take care of them as we would corn, the first year. We don't put the straw on until the second year. We pull off a part of the new sprouts, leaving about four new canes in the hill. The rows are eight feet one way and three feet the other. We pinch all that come up, once, then let them grow as they please. With straw on the ground it doesn't matter if they grow down to the ground.

The straw keeps the berries clean and the berries are shaded; they are the best we have. In Wisconsin after you get above Madison, they tip over the blackberry and raspberry bushes and cover them with earth. In that way they are sure of a crop. I have seen some covered with straw; no mice troubled them. Perhaps that might be necessary or advisable up here; with us, it is not necessary with the hardy varieties. I would keep the runners off strawberries about ten weeks after setting them in the spring. The blossoms, of course you want to cut off; not let them bear; then let them go as they please. If you want something fine, thin them out so you will only have plants six or eight inches apart in diameter. You will get an abundance of fruit simply by keeping the runners off two or three months, then let them grow. I spread them out like spokes on a wheel and they cover the ground. Strawberries need mulching you understand; it is about time to put it on now first of November.

With us, we put it on about the middle of November, and your ground is as cold now as ours is then. There is no money in setting fall strawberries. You would spoil the usefulness of the vine for the next year; even if you kept the berries off the next spring you wouldn't get any better crop than if set in the spring. You want to set in the spring and let them keep growing until winter strikes them; then it is possible for you to grow three hundred bushels per acre or more. But you cannot do it by letting them go and get stunted; they must be kept steadily growing all the way.

Ques. What do you mulch them with?

Ans. Wheat straw. If your land is thin and you want to fertilize them, you cannot get anything better than strawy horse manure if free from weed seeds.

Ques. Do you ever smother the plants and kill them?

Ans. No. I don't think you can smother them unless you put on too early; if you wait till the weather is cold and the ground frozen you couldn't. I have mulched two or three rows to keep them back to prolong the season. I have put straw on after the ground was frozen as deep as that—(indicating two feet). I had to be careful to take it off before the new growth started. If I let them start under that weight of straw they would be injured. The sun or frost would injure them when I took it off. When the ground gets warm, you must take off the straw. Take it off in a cloudy day so the sun will not injure the plants. You can prolong the season a week or ten days safely, in that way. We do that, because the strawberries are important to me.

You cannot prolong the season by getting a late berry;—I hope there is no plant man here—I paid some dollars to find that out. I asked lots of horticulturists and only one of them told me the truth. One man told me, but I didn't believe him; I believed what was advertised in the papers. I sent and got a lot of strawberries. I got the Gaudy. It was advertised to be later than any berry; it was ten days later in ripening the first fruit. We picked from the Haverland ten days before the Gaudy and just as late. I have tried three or four late berries but I haven't found one that will prolong the season above our standard berries.

Ques. What blackberry do you prefer?

Ans. Taylor's Prolific is as good as any; it is a long berry and I prefer the long berries to the round ones; I don't know whether it is hardy here.

Ques. Do you cultivate anything with your strawberries the first year?

Ans. I would not. A farmer doesn't want to bother; land isn't of so much consequence. A man with land worth $5,000 an acre can afford to bother with it; you cannot afford to do it. If I were growing strawberries for the market, I would do differently. I would take more pains; because you would put labor, time and skill into it, to get money; but for a patch to eat, you don't care; you had better put out a few rods more land and not take as much care of it. You can have all the berries you want to eat, without taking such excellent care of them as you would if growing them to sell. There is no money in growing anything to sell, unless you do your best. The time is past for any half way work.

Ques. What variety do you recommend for general culture?

Ans. There are a dozen varieties, all good. One is best in one respect and another in another. The Haverland is the most productive. They are beautiful and sell well; I don't want many of them to eat. The Crescent is the lazy man's berry. They will give you a crop without much work; but they are sour and small. I should have to be hungry before I should eat them. The Crescent will stand any sort of abuse. The Downing is one of the finest berries for quality we have, but it is a shy bearer. The Gaudy has a peculiar flavor; it is like pine apple; but they are beautiful. I never saw any berry more handsome than the first picking of the Gaudy; but you will only get a few pickings of them; they are not productive, as I have had them. The Bubach No. 5, is a large handsome berry of fair quality. I have seen those that were six inches around running about four and a half.

I have some photographs I would like to show you. One of them shows two rows of the Shaker blackberry fifteen months from the day they were set out. There is a whole sermon in them. There is a man standing between the rows. They were six feet high, fifteen months from the day they were set. We had picked a bushel to each row before the photographs were taken; we gave them a great deal of care. (Exhibits another photograph.)

Here is a photograph also of our strawberry patch a few weeks after we set them out, taken when they were cultivated. You can see the plants, two feet apart in the row. I have spent a good deal of money in taking object lessons to the farmers, because it leaves an impression that talk will not. So I try to awaken attention to these points. (Exhibits another photograph.)

Here is another picture of strawberry plants just before picking,—Haverlands—they yielded at the rate of over one thousand dollars worth to the acre. It was done by a large amount of work; but the work wasn't large in amount as regards results. I would give plants plenty of room. Here is another little sermon equally applicable in every line of farming; whether you raise sheep, make butter or grow potatoes. And that is,—the *best*, will give you the best profit, if you manage right; while the opposite will not. I was going to town one day with several bushels of berries,—we had one half an acre,—and it occurred to me that I had better have photographs taken. I took two boxes of the Gaudy. We had had the week before the Bubeaus which were larger. I got these photographs, then I wanted another kind to compare with them; so I went to the Cleveland market and picked out some of the common market berries and got a photograph of them. You can compare these two. The market was overloaded with the small sort. The dealer told me he could buy them for one dollar and twenty-five cents a bushel; sometimes they were two dollars. I sold mine for four dollars a bushel. I set my price. If you get something a little better than others, you can set your own price. If I had a thousand bushels, I could sell them in the market during the season.

Ques What kind of soil do you grow them on?

Ans. Ours is a clay loam; you can grow them on drifting sand or clay.

Ques. How about muck soil?

Ans. They grow to vines but don't fruit well. The great trouble is the frost; you can set them on a hill, but not on a low spot on account of freezing. Clinch this idea and take it home with you. Push ahead and do a little better than the average, then you are on the road to prosperity. But don't forget to set out more fruit for yourselves, then have a good time. Lots of farmers are preparing to enjoy themselves by and by; but it is best to enjoy yourselves as you go along; and you get quite a good deal of enjoyment from half an acre of ground. I don't think you would slight that, after you get interested; I cannot now. I want to see how nice and big I can make them grow. I can get up half an hour earlier in the morning to work in the patch.

Ques. With reference to the blighting of strawberry blossoms. They do sometimes set, but fail to fill and after growing to the size of a pea, they stop. They are colored a little so a few of the seeds show.

Mr. TERRY. Did the berry appear to be perfect on one side and imperfect on the other?

QUESTIONER. A little of both; seven-eighths didn't fill out at all; it was mostly black.

Mr. TERRY. It was from want of fertilization. It was from an imperfect variety with no perfect variety near it. There is the advantage of setting out a new bed every year. If you let the old bed stand two or three years you will not get as many berries.

Ques. Have you experience with commercial fertilizers?

Ans. Yes. They do no good whatever on my clover soil for potatoes or strawberries. I have put on a handful of Mapes fertilizer around the hills at a time and done so three or four times during the season. You cannot tell any difference either in the growth of the vine or in the fruit. Clover in heavy growth, turned under, furnishes all the plant food that our soil and crops can use. I have spent a hundred dollars probably, in testing these fertilizers year after year; but I didn't get one cent back. I wouldn't give a dollar for a carload of fertilizer to put on my land. I put it on in strips on different kinds of crops, right through the field and watched it, but it didn't show at all. The soil is what we call oak and beech. A portion is chestnut soil; mostly clay soil. I wouldn't have you understand that I speak against fertilizers; but I know that they don't pay me; I know that I can feed my crops with clover a great deal cheaper.

Ques. In what state of growth do you turn the clover in?

Ans. We never plow it until the following spring. Our open winters are not the right kind for fall plowing. The land would all run together. We never plow till spring.

Ques. You make no criticism against commercial fertilizers. It is simply a matter of economy?

Ans. Yes. It does not pay me and the clover does. There are farms in our town, where fertilizers pay well; but they don't use clover. We use the common clover. I think, in our locality where the fertilizers show good results, the soil is heavy and they grow timothy instead of clover. I sow six quarts of clover seed to the acre and no other grass seed. I begun by sowing timothy in the fall and clover in the spring as farmers do; but I soon found I wasn't getting as much growth of clover as I wanted. When I sowed timothy in the fall, it occupied the ground, so the clover didn't have a good chance. After a little, it struck me that I would leave off the timothy in the fall and put it on in the spring. The clover and timothy then had an even chance; and the clover being rank a feeder, held its own very well. After awhile, I thought I would drop the timothy entirely; so late years, I have sowed clover altogether.

Ques. What if the soil is poor?

Ans. We have soil where it would be necessary to top dress to get the clover; but when I can get a good growth of clover, I can keep it up. That is what I work for,—to get a heavy growth of clover over every square foot in the field. I use all my manure, to feed up poor parts of the field and get a uniform growth. Then I am all right the next year for the potatoes and berries.

Ques. Would you recommend to plow in the clover when it is green?

Ans. I wouldn't on my farm; it might be best here. I don't like to answer for you here.

Ques. Is it probable that any advantage could come from plowing it when it was green?

Ans. There is a little advantage in one respect. Green clover plowed in will decay quicker than dry clover. That's the only advantage I know of. There is no loss by letting it stand through the winter. It is only a question whether that clover will decompose in time to make a crop. Now practically, on my farm, for potatoes, clover plowed under in the spring is just right. When potatoes get along to the point of full growth, pretty nearly ready to stop; the clover then carries them along and crowds them at the last end. Any potato grower knows that is what he wants. If by any means you can make them grow a week or two longer, you can get a better crop.

Ques. Do farmers generally practice plowing in the spring, in your section?

Ans. Yes; there is but little land plowed in the fall with us. It is not safe in our locality; but that is nearly a thousand miles from here. Our open winters make a difference. We have heavy rains which pack the ground so it is in terrible shape. It is more work to fit it then, than to plow and fit it in the spring.

Ques. Is clover all the hay you raise? and do you feed it to your work horses?

Ans. We haven't anything on the farm except clover; we don't grow anything else. I never bought or sold any hay. We feed nothing but clover. Clover with us, is a by product.

Ques. How many years does the crop last?

Ans. We let it last but one year. When the roots are of maximum growth, if it grows larger it will run out. We take it at its best and turn it under and into money. In our locality, it grows two crops. We cut the first crop for hay; the second crop goes back to the land. The second crop is about as large as the first. We cut the first crop in June, just before it is in full blossom. We never turn stock upon it. We get about as large a crop the second time as the first; *that* is what we put under. I presume you can plow here about as soon as I can. I want to plow about the last week in April; sometimes I cannot; then there are warm days so you can plow the first week in April, sometimes.

FRIDAY AFTERNOON.

HORSE BREEDING.

By C. M. WINSLOW, Brandon, Vt.

Mr. Chairman, Ladies and Gentlemen: I am very glad to see so many ladies here this afternoon. Sometimes when we are expecting to have an address on horses, the ladies think it isn't the place for them and leave and we have a body of gentlemen. But I see no reason why ladies should not be interested in the breeding of horses. There is no animal on the farm that adds so much to the comfort as a good horse. I don't know the ladies here; but ladies generally enjoy a fast horse; the faster the better.

There are advantages to all of us in raising horses; because we need them on the farm; we are obliged to have horses to transport our produce to the market, to do the work on our farms and for driving. The question is, whether we will breed and raise our horses or buy them.

I don't think I would advise the farmers of the State of Maine, any more than I would the farmers of Vermont, to make a specialty of horse breeding. This is something which our friend from Ohio will not uphold me in, as he advises special effort in one direction.

I don't think I would say to our farmers, go entirely into the horse business; but one or two mares on the farm will raise all the stock we want and bring us in a few dollars now and then. There is an advantage in raising our own horses as we know what we get. If you buy a horse, it is a good deal like marrying a wife. You never know what you have until they have summered and wintered with you. If you own an old mare and have raised a colt and broken it, worked it in, you know the tricks of that animal; but if you bought it, you know nothing about what has been educated into that colt before you got it.

Then you can keep one or two horses on the place at very little extra expense, in connection with other stock. There is hardly a farmer who has not a flock of sheep, a herd of cows. You can keep one or two brood mares on the refuse from the sheep and cows with the addition of a little grain, &c. They will winter nicely. The summer pasture, they will need more or less, but they like rank grass and will eat much in a pasture that cows will not touch. But there is one thing I would not do with the horses. I would not turn them upon the mowing field. They will pull the grass up by the roots and ruin a meadow.

There has been brought into the United States from the old country, a good many breeds of horses, highly recommended. The first ever brought into this country was the English thoroughbred. They are probably the foundation of our trotters and American road horses; when there was a demand for carriage horses, the Cleveland bays were brought over to fill that want, but I have noticed that although the Cleveland bays have been introduced into the country a good many years, they are hardly more numerous than years ago. I don't think they filled the want of the American market.

The American wants a peculiar horse with a good deal of life and ambition; a good deal of endurance. The Cleveland bay, while it will answer nicely for a general carriage horse to drive a mile or two and return in great style; if you put him where the American wants to put a horse, eight, ten or twelve miles an hour, is out of the question. I never have owned a pure bred Cleveland bay; but it has been my observation, and as far as I have conversed with others, as a rule, they would uphold me in that opinion of the Cleveland bays. I don't think they are the horses for New England.

Then we brought in the French coach horse, which was said to be very sturdy and hardy; a better road horse than the Cleveland bay and a little larger. It is a question, whether they will fill the want of America. They are large, but it seems to me from what I have seen and from observation of those I have owned, that while they are large, serviceable, kind horses, they are really nothing more than work horses. There isn't that ambition, that snap, that the

Yankee wants. Then there have been brought in for work horses, the Percheron, from France and the Clyde from Scotland. These are large, strong horses, good for heavy, slow work. I think upon the soil of the West, where they require them to work with the plow, they do well; and certainly in the city where they are called for to draw heavy loads; they are large and heavy and can resist the jolting, while if you take one of our light limbed horses, our American road horses, and put them upon the heavy wagons, the jolting of the pole would swing them as they are too light.

The question with us is, do we want very heavy horses on the farm and are we able to keep two kinds of horses? Do we want horses to do the work and another pair to do the driving?

I want a pair to do the work on the farm and do the driving together; a general utility horse. I think the Maine and Vermont men want a horse that don't need two hours to go eight miles. There is the Yankee nervousness in the Maine and Vermont men and in their wives that can't stand it. Then there is one other breed; the American roadster, or American trotter whose foundation is undoubtedly the English thoroughbred. In Vermont we have built them up, perhaps from two lines of horses. One was brought into our State from Connecticut, a bay colt, about a hundred years ago, of about nine hundred pounds weight and about fifteen hands high. The horse was very compactly built, short, strong legs, short, strong back, a high head, bright eye, intelligent face; a horse with strong points all over him. They took him to Randolph and called him Justin Morgan. He was owned by a man who taught school in winter and in summer worked him on the mountain.

It is related that at one time he was working out on his outland and drove to the tavern in the evening. In those times it was the custom for men to gather there in the evening to talk over matters. That day they had tried to haul a large log on the rollway in the mill yard. A man had offered a gallon of rum to any one who would draw this log on the rollway. That was sufficient inducement in those days for a man to try it. When Mr. Morgan came into the tavern and heard them talking, he said he would like to try it. They said he couldn't do anything with his colt and after considerable talk, he took the horse to the mill yard, hitched him on and told a couple of men to get on the log. They got on, he straightened the horse out and started. He drew the log a little ways and the next hitch he drew it upon the rollway. Whether he got the rum or not, I don't know; but the horse showed great strength.

I was talking with ex-Gov. Holbrook about Morgan horses and he told me this. He said a friend of his knew the circumstance. There were three bets; one of $100, that Justin Morgan could out-pull any other horse; another of $100 that Justin Morgan could outrun any other horse, and another of $100 that Justin Morgan could out-trot any other horse. They knew his strength in pulling; they had seen him run and they put up $100 to see him trot, and lost their money. They were in the habit of running a horse a short distance; measuring off eighty rods drawing a line and starting from the stand. Justin Morgan would almost invariably win on an eighty rod run. He would start from the stand, and start so quickly that he would always win. He was not only powerful in the harness but fleet on the foot. He could outrun and out-trot any horse brought against him in those days. He would trot in about three minutes. Now with your Nelsons, it is 2.10. That was the foundation of a good deal of our stock in Vermont. Your Gen. Knox was brought from Vermont. He is the foundation of a good deal of stock here in the State of Maine.

Justin Morgan was not only all I have said, but was of so nice a disposition that a lady could drive him; a fine stylish horse; taking all these qualities, extreme intelligence, ability of foot, strength, disposition, he was a good foundation for stock to breed from. Then about the same time, there was brought from England a thoroughbred running horse, a gray horse, larger and coarser. He had won a good deal of distinction as a runner and was brought here to improve the running stock of the country. It was said that the journey over was rough and there were two other horses that were so enfeebled they had to be helped off the boat; but when the gray Messenger came he started down the gang plank and ran up the street with a groom on each side trying to hold him. This is another element you have here in the State of Maine;—the old Messenger blood that has been crossed with American stock has the wonderful power and strength that has given us the American road horse. Other lines have come in, which I will not stop to mention; but this will show the blood that has been bred in to build up our American road horse that you will find all over the states of Maine and Vermont. If I were to advise farmers what horse to breed, I would say, breed for the farm and for sale, the American road horse, tracing back to the Vermont Morgan and your Messenger and other horses of similar blood.

A good deal of the stock that comes from Canada may be different; but if you will bear in mind, a good deal of the Canadian stock came from England. I was in Quebec when the English army was just going back. They had their horses for sale. They looked like English cobs. They were strong built horses. It would be strange if their progeny didn't work into the borders of our State and add to the foundation of our stock in the way we have talked about; so whatever line you twist our stock, you get it back to the English stock. The Hackneys are being brought over now. Dr. Webb has brought over a good many English Hackneys. I was talking with his manager whom I met on the train; I asked him why the doctor with his money didn't go down the Lake Champlain valley and pick up our Ethan Allen mares, breed from them and make himself a name with Morgan stock. He said he had advised him to do just that thing; that he could buy stock better than he was getting in England right around Lake Champlain. And as I have seen his horses, I think they are no better than our Morgan stock. I don't think they are going to give us anything that is an improvement and they cost a great deal of money. There is a good deal of style to them; they step high in the air but all their strength goes to get the knees and hocks up. The Hackney is not large enough to be of great value; no larger than our own horses. It is only a high hock and knee action. If I am correct, it is not a breed but a type of horses; and I think it is nothing we wish to breed from or perpetuate.

Now we need on the farm a horse that is able to draw the plow and mowing machine and to take us eight miles an hour on the road; one that can plow all the forenoon and drive in the afternoon. We don't want to rest him; we work day in and day out; we want a horse that has endurance enough to do that; we want a horse large enough to do it. We don't want overgrown horses, but we want horses that will sell and bring something; horses that people want.

Now while I would advise a man to breed horses, I would not advise him to unless he likes horses. He had better trust to a friend's judgment, than undertake to breed if he don't like them. But if he has a liking for them, has work for them so he can work them in without too much cost, let him breed and breed with care. What kind of horses is it that the public wants? Perhaps here in

Maine you want trotters; but I haven't much to say about trotting horses as a class. That which I find sells best, that which my customers want, is a horse that will weigh anywhere from ten hundred and fifty to eleven or twelve hundred pounds; from fifteen to sixteen hands high, good style, good action; a horse of good color, good disposition, pleasant driver. Where do you get them? You don't among the Clydes or Hackneys; the French coach or Cleveland bays. You won't get them among the trotters of the time; but there are some who have that kind of horses; and that kind of horses are good on a farm, they will plow, run a mowing machine or go to market. Men don't plow all day. That kind of horse will mow on the machine, and will work a six feet cutting machine; draw in all the hay and if you want to drive to market, will hitch up and drive. They can go eight miles an hour; and are in demand where I live, for city trade. Very often I have a call for just that kind of horses and they are willing to pay for them. I had a letter from a man who said he would like to know where he could find a horse or a pair that would weigh eleven hundred, good color, nice drivers, showing a three-minute gait. I was out here to the State Fair and I enquired there and elsewhere, but I haven't found them yet. You would think, that of all the horses in New England, you could go out and in two hours' time, find a pair that would show a three-minute gait, with good style, pleasant drivers. But try it some day. Start out and hunt up a single horse. Perhaps you have more of them than we have in Vermont, but they are rare.

That kind of horses I would advise farmers to raise, for the reason that they are always in demand for a single horse or pair, at good prices. I call from two hundred and fifty to six hundred dollars apiece a good fair price to raise a horse to five or six years old. I have sold a good many horses all the way from two hundred to six hundred dollars, and I could sell a good many more if I had them.

That kind of horses will do the work on the farm, while they are waiting for a buyer. Now how will you go to work to raise them? What kind of a start do you want? You want one brood mare of that kind. That's a very important point; there is the crisis; whether you breed to success or failure, depends upon what kind of a mare you start with. The mother has a good deal to do with the quality of the offspring. It is an important thing with horses and with men. Show me a smart, intelligent man. I tell you his mother, in ninety-nine cases out of a hundred is a smart, level-headed woman. His father may not be intelligent, but his mother is. If you wish to get a good horse, with pleasant disposition, a horse with power and speed, a horse that is worth something, you must have those qualities in the mother. I prefer a good horse for his sire, but his dam *must* be a good mare. For that reason, I would select with the greatest care, the mare that I was going to breed from. I would have a mare that weighs not less than ten hundred; from that to twelve hundred. I would like her to be of good color; I would like to have her sound; I wouldn't have her have a ringbone; I would rather she wouldn't have a spavin; I wouldn't like her to have the heaves; but I would have her of good disposition; I wouldn't have a kicker or a balky horse. I wouldn't have those traits in the mare that I couldn't get along with in the colt, because she is almost sure to give them to her offspring. I like a mare that will do what she is told, because I think her colt is a good deal more likely to be that way. I think she gives her traits to her offspring to a great extent. I think the sire of a colt adds to the traits of the colt; so the offspring should be carefully guarded on both sides.

Did you ever see a boy come up a perfect rascal who had a nice father and mother? You wonder why such parents should have such a bad boy. Perhaps some old man will tell you, "I knew his grandmother" or "his grandfather; he is a chip of the old block." While I would look at the sire and dam of the mare, I would also look at the grandfather and grandmother and get just as many lines of good disposition and other good qualities in the mare as possible. That is one reason why I like standard bred stock;—if the truth is told, the chief thing I would like in the standard, is the fact that it gives the pedigree, for I then know what lies back of my mare. Then having a good mare, have a good sire.

Ques. Wouldn't you add the nervous energy there?

Ans. Yes, thank you, there is another point I would add to the mare; that is, the nervous power. I want the mare full of nervous energy. I don't mean ill temper, but desire to go ahead—to take hold and do something. You see it sometimes in your men; you see it often in your wives. They will carry through any amount of labor; they will go until they drop. I want a mare that will do until she drops, if I am brute enough to let her. I want her full of life and fire.

Night before last I was up to Dover, and as I was standing outside of the Grange Hall waiting for the team to take us to the hotel, a gentleman, a stranger, led a prancing mare out of the barn. She pranced around and he told his wife to get into the wagon. She was pawing the ground while he was hitching her on. I said, "Shan't I hold your colt?" He says, "I thank you, but she is twenty-six years old and ought to know enough to behave herself." Now that mare would raise a good colt. That man wasn't afraid. She was pawing the ground but she didn't move out of her tracks. She waited till he got ready and gathered the lines up and then she was off. Twenty-six years old! What was she when young? She had that nervous energy that would repeat itself. If you want to breed trotting horses, there is something you want; you want nervous energy, that will enable a horse to travel any number of miles and win; you want a horse that will "*get* there."

Sometimes you have a man in your community who never had very good advantages;—but that man will "get there" every time. It is not his intelligence but that nervous power that knows no defeat. When he starts, he will get there. That is what you want in a horse; that nervous energy I think the mare gives her offspring.

You must have intelligence. It is worth something to you, if you have a horse with all this nervous power, all this energy, and one that is perfectly safe; that is level-headed; a horse, that if anything happens, won't lose his head. There are some horses if anything happens suddenly, you lose control of and they seem to know nothing. That kind of a horse you don't want to breed from; but take a level-headed, intelligent horse, with fine disposition, with nervous power; with size; and you will have a colt that is worth something. After you have a good mare, I don't say what kind of speed rate you shall breed for, but if you can get the service of a horse of the above size and style at a reasonable price that has a fine record for speed, I should do it. The difference of a few dollars more or less, put into a colt isn't of very much importance. I don't say I would pay two hundred dollars for the sire of the colt. I would breed close to trotting lines of good size and style, so you would have every chance to make a dollar.

If your colt trots, very well. If he doesn't trot, but is of good size, he is a good road horse. If not a good road horse, he is a good farm work horse. Whereas, if you breed a small trotting horse, if he trots, it is well; if he doesn't, where are you? I think the training of the colt should commence about twelve months before he is born; begun in the handling of the mare. I would treat her as I would a lady; with respect and attention. I would feed her, not to make her fat, but a good quantity of bone and muscle producing food; give her moderate exercise; have her work, but not have her annoyed but kept pleasantly the whole season through. If convenient, it is good to keep her up, work her in a pleasant way and drive her, if you are a pleasant dispositioned man.

You can make the disposition of the colt. I think you can greatly change it by the way you take care of the mare. Then when the colt comes, I would begin to train him when he is a few hours old. It is a good time to handle them; put your arms around the colt; he will try to get away; hold him quietly, don't have much of a struggle with him, but just hold him and pat him a little. He will very quickly give up, when he finds he is not hurt he will very quickly stand and let you pat him. That colt has learned that you are stronger than he, and he will never forget it; he has started off with a good deal of respect for your power. It is worth a good deal to have him feel that you are his master. I don't like to *break* a colt; I like to train them. There is all that power in the horse, but you want that power kept in, controlled and directed by you. Many a colt has been spoiled by breaking. What is a boy good for that you have to hold in with a curb bit until he is twenty-one? He is a great grown baby. He has got to get the mastery of himself when he goes out into the world.

A colt that has grown to five years old, held in with bit and bridle, when he gets loose, knows no control; but if guided by the touch of your rein he has learned to be controlled and directed by you, when you get into a tight place it is worth something to have that horse directed by you and understanding that you are his master and that he is to be directed entirely by you. I have a colt that we drive, broken in that way. I drove up to a place where they were shingling a building. I left the wagon and the first thing I knew my colt gave two or three bounds away from me. I said *whoa*, two or three times and he stopped and I caught him. He had learned to obey my voice. The trouble was, some one had brought a bundle of shingles and thrown upon the staging over his head and some fell down: but even in that fright he knew the power of my voice and was controlled. I had tried to teach him that I was not only his master but his friend; that he was to be governed and controlled by me. I can drive him anywhere. I had occasion to go where a circus was putting up their tents. I had to talk to him all the time, but he went where I told him and I drove him all around, among the tents. I would train a colt in that way until he is a horse.

Then how will you care for the colt? I like to let them run with the mare until five months old. Then take them off for the good of the colt that is to follow. I like to put the colt into a good box stall and feed him with milk. I teach a colt to drink milk by setting a pail of warm milk in his stall. He won't drink it at first; but I don't give him any other drink until he does. Sometimes it is twelve hours, sometimes twenty-four or thirty-six that he will not take the milk, but after they take a few swallows they will like it. I had as soon have skim milk as new for a colt, for the reason that there is bone and muscle in the skim milk and not much fat. I feed a colt with plenty of good hay, wheat bran and oats; putting quite a quantity in the box. They won't eat much, unless they have been educated with the mare. They will take to it in a few hours. I would continue with liberal feed through the first winter. If I were going to raise horses in the cheapest manner, I would keep them well through the first winter. If you are going to starve a colt do it after he is a year old. If you do starve him the first winter you can never get him over it. If you feed him the first winter with plenty of bone and muscle producing food, skim milk or bran, oats and hay, and give him plenty of exercise, that colt will grow, come out in the spring and go to grass in good shape. Whether you feed the next winter or not, I leave to your own judgment. I like to feed them the second winter but not more than I would the first.

The second winter, if I am trying to bring them in cheap, I feed with coarser hay but with a very valuable colt one doesn't want to save twenty-five cents by feeding coarse hay. It is as well to feed good hay the second. The first winter I like to begin to train the colt with the harness;—not hitched to anything, but put on a light harness. That keeps up the colt's idea that you are his friend. I don't like to play with a colt or pet a colt; I don't like to have a colt that has been trained to drive made a pet of, as I have to undo all that; I can treat him kindly and politely, but I don't play with him. Where the colt has been brought up a cosset until he is three or four years old, he is a hard colt to break. The second winter I would continue the same process. I am trying to make as much money as I can. I work in my geldings and breed my two--year-old fillies. They don't receive any injury and I get a colt. That helps to pay expenses. You may differ with me upon that question; but that is your privilege. When the colt is about three or four years old, I put him to work. I don't think it hurts a colt to work, even if he can trot. I am not raising trotters, but horses for service and to make money. It does not hurt a boy or girl to work, and it does not a colt. They are as well doing useful work on the farm as standing in the stable kicking.

I cannot sell many horses under five years old, but when they get to be four, coming five, I like to find out what they are. I will risk a farmer to know what he has. If he has judgment to select a mare and breed to a valuable trained horse, he will find out whether his colt will trot or not. Sometimes when he is coming from church, he will hurry to get home and go by his neighbors, and it is known that that man has a trotter. Then you will decide whether you will make or lose a dollar

When you have a trotting colt, what will you do. Jockeys will tell you you have a valuable colt, one that will win a great deal of money on the track if you would let them train him. The jockey persuades you and the neighbors tell you you have a fast colt and you think you will invest a few dollars in training. My advice is, *sell* it; don't train it; let somebody else take that risk. Your business as a farmer, is *breeding*; you have raised that colt without great expense up to that time; you have made him work at three or four years; he hasn't cost you a great deal; he is sound and kind; he will go down street at a slashing gait; he has the appearance of going within 2.30. Somebody will want to know what you will take for the colt. Ask a large price; ask one or two thousand dollars if you choose, but don't let a good offer stand. Sell it, you have the old mare and another colt coming on, let the colt go; but put him into the hands of somebody that is going to train him; then if he shows a 2.30 gait, if he makes a record, let it be known that you have others; you will sell more at a higher price. But don't train them; just sell, and you will put money in your pocket. But if you are so thoughtless, so careless of your own interest to think that you, a farmer; you, a breeder, can take that colt and make money by having it trained you will lose by it. It takes an engineer to get a colt any faster than a three minute gait. I cannot do it; you cannot do it. You have to hire an engineer to train the colt; there are plenty of them.

A man will tell you he will train your colt to go in the 2.30 list if you will let him take that colt to the track;—you can pay him what you please, to pay the keeping of the colt; he would like to handle him, only you pay the keeping, and a *moderate sum* for training and he will help you sell him. Well, gentlemen, if you are ready to lose money, let him go; let the fellow take him. When he has been there a week or two you want to see how he acts on the track. You go and ask the driver how the colt does. He says, "He is going to make a trotter." You ask him to take him out. "Well, he cut himself a little yesterday; I don't think it is best to take him out to-day; but the next time I will have him ready. He is doing splendidly; I have had him out this morning." He will give you seventy-five reasons why he shouldn't take the colt out. Just before you go he will ask if you have a little money; he wants $15 or $20. You give him all the money you have and go home. That may be repeated just as many times as you will respond.

You want to see the colt trot at the fair. There is some reason why that colt doesn't win; some reason why he doesn't get the third money. Finally, you conclude to sell that horse and you sell him at a loss. Just as likely as not, that man is a friend to the jockey and that horse comes out a 2.30 performer. Your business is to breed horses, not to train them.

I think gentlemen, that horses bred, trained, and sold in that way, can be made a source of revenue to the farmer. Good feeding, good breeding, good business judgment in feeding as far as you can feed them; then quick sales will make the horse business pay on the farm.

Ques. Why do so many fail; why with care in the selection of mares and sires, the large amount of good blood in the State of Maine does so large a per cent of stock fail to come up to the standard?

Ans. My observation and my opinion, gentlemen, is that too many men breed for speed. They breed for that entirely. That is why I said but little about standard breeding. That means a horse that goes in 2.30. What is that worth to a farmer or gentleman's driver? Nothing. I say nothing against speed, but I want speed in the right kind of a horse or mare. I believe I will get it with the kind of mare I have described. I haven't said that the mare should trot in 2.20 or 2.30. I have a pair of horses that I bred in that way that show a three minute gait; I will have a better price. If 2.20 so much the better; but I would not breed for speed alone.

DR. G. M. TWITCHELL.

I rise to endorse, as I do most heartily, the able lecture by my old friend from Vermont. It seems to me it covers the ground very fully and I don't know as I can add anything save perhaps in one particular.

In speaking of the selection of brood mares he has given us the different types of horses available; but we might carry this a little further. There is one reason why we fail in breeding; we take a mare with a draft conformation, breed to the trotting conformation and get nothing. I saw a good blooded mare the other day, having good head, neck, shoulders, forward legs, body and coupling; but when you struck her hips, she was draft stock. She had good knee action, but dragged her hind legs, because of that draft conformation behind, the result of an outcross of cold blood. That is one reason why there is so large a per cent of failure.

Men are scouring the State of Maine for the best class of horses. Mr. Horne of Waterville is able to pick up, sometimes ten or twelve horses in six weeks' time to send to New York; but they don't come quite up to his standard. He wants something better than he now finds. Buyers want a sloping shoulder, deep, egg-shaped barrel, long quarters and then there is a probability of power and a possibility of action. It is the power in the hind legs which gives speed to the horse.

We should fix in our own minds what we want to breed for and go to work and get the animal with a conformation in accordance with the requirements of the case. If we want to breed draft horses, if you have in mind a draft conformation, that is if the horse you want to grow is of blocky build, straight in the shoulders, broad, full chested, round bodied, short in the quarters, straight on its legs, with short stout pasterns, it is of no more use to attempt to grow trotters than it is to fly, simply because of the fact that our horses are only what we make them by generations of breeding and selection. They will conform to our ideals even if we are not conscious of the power we are exerting. If, instead, the desire is to grow a well-formed, smoothly turned horse of size and substance, capable of covering a long distance in a day and coming home the next, there must be a study of this question of form. We need here the long sloping shoulder, the point of the withers reaching back well under the saddle, the deeper barrel, the longer quarter, and equally strong coupling. These insure possible road qualities desired by every man who drives. Any attempt to combine these two extremes, and they must always be extremes, will result in what is known to-day as the scrub horse which has, and can have, no place in the market. There was a time when these horses had some fixed market value, but, in the education of the masses to the value of good road qualities which has been going on for the past twenty years, and the consequent rapid increase in this better class of stock, this "common stock" goes to the wall and the man who clings to it does so at great personal loss. While by generations of breeding there might be a family established through this manner of breeding there is not the slightest call for it, as all about us can be found stallions which have been bred for some specific purpose and they will, if rightly mated, give the breeder what he is seeking for. It's dollars, not fancy we should seek after. If failures result it is only because we have not conformed to the laws which govern, and through a study of individual characteristics made intelligent matings.

Here to my mind is the study of the future, to make selections of brood mares and stallions which will give a more uniform class of youngsters, patterned after the will and wish of the breeder. These, and all other problems, are governed by laws and we seek to come unto a knowledge of these and their operations, if the element of uncertainty is in any degree to be eliminated. In the present condition of the horse business this seems absolutely necessary because we cannot afford to grow horses for fun. There is a dollar in the business for the man who comprehends the situation and conforms to its requirements. It means work. It means the exercise of brain power. It means the disciplining of ourselves to an appreciation of the exacting conditions which prevail and *will prevail*. One of the demands of the present is that the word "break" be stricken out of use entirely so far as the colts are concerned. Our best horses are what they are by reason of breeding and education. In "breaking" you never build up. You can break down and the whole influence of the word is to strengthen a desire to subjugate, to get under control, to hold down. Substitute the word educate and then go to work to fix ideas in the minds of your colts. Control by your superior knowledge, and their full confidence in you and your wishes. This is the control which is desired and which in the time of trial will put the animal completely in your hands. If improvement is to be the order of the day in horse breeding, as it must if it is to be made in any degree profitable, the colts must be educated to know the full measure of their powers and to do their best. This is education, it is a building up and not a breaking down. The tricks and faults of our horses are very largely due to their early training. Teach only what you want them to know and a far greater measure of safety will be insured than is possible by any other method, while all the time the quality of the grade will be improved. The future of the business in Maine, as everywhere else, is to be one of real merit, the result of the most careful and pains-taking breeding and the most complete education. Here is the line of profit and in no other can it be assured. The valuable suggestions of the speaker of the afternoon should be remembered by us all for they strike at the root of the problem, and I am glad to have had the opportunity of listening to the delivery of this address.

Ques. With regard to late feeding of young stock in the field as we saw them to-day. Is that good practice?

Mr. WINSLOW. My custom is to get them out about this time; when I have weanlings I get them up early; but these colts may as well be out while they can be comfortable; they don't go out again till spring. All my horses, as soon as the grass has no nutrition, are put into winter quarters. It takes more hay, but my horses are fat in the spring, and I had rather have them fat in the spring than save a ton of hay. Every day you let the horses run on the meadow your stock is going down hill and you are injuring your meadow. They are filling up with worthless material. I think it is too expensive; I cannot afford it. It is easier to keep an animal growing than to let it go down hill then bring it up.

Ques. Do you feed linseed meal the first winter?

Ans. I would rather have colts grow than get fat.

Ques. Is chest founder and spavin transferable?

Ans. I think it is. They wouldn't have it as a rule, if there wasn't a local weakness. They are very apt to give to their offspring the same trouble. I do breed from a spavined mare; but at the same time if she had been very strong she would have resisted it. It is the weak spot that gives out. I never saw any stock that was whole, in every particular; every kind of machine has some weak spot.

Ques. What is the cause of chest founder?

Ans. Good authors say it is laminitis,—inflammation of the foot. You may drive a horse over frozen ground and let them get cold it creates an inflammation, the blood gets in and if the inflammation is not taken out it makes the bone enlarge. It sometimes affects them in one place and sometimes in another. It is inflammation from concussion. Sometimes it hardens by a horse standing in water when warm. It is really a cold that settles in the foot.

DOLLARS IN THE DAIRY.

By J. L. Gerrish.

It is decided that we will have just as good horses to drive, as good tools to use and do all things as other people.

I decided one day that I must have that *dollar* some way. I want to get it in some honorable way. I see your secretary has got on his programme that something was going to be said about the *dollars* in dairying. Seeing no other way, I decided to do something at private dairying. I made up my mind that in order to do anything to get satisfactory returns, I must do it in the very best manner I could. I looked about me,—I was prejudiced in favor of red cattle and I had them. A good many men advise you to begin right there; buy a male animal and grade up. I had a little credit and a little money; and I went out and bought four cows that would make forty pounds of butter a week. I was situated where we had Alderney cattle. I was able to do that without buying into a herd book. I didn't buy scrubs, I was able to buy cattle that were dairy cows. So I stepped out again with a new breed. I think better of myself that I had the courage to do that. I would think highly of any community now that would have the courage to do anything reasonable in the same direction. If you are going to get the *dollar* in farming, you may as well make up your mind that you are going to do something and do it regularly.

After following private dairying,—getting thirty cents a pound for my butter,—I was able to stand up and face my friends who called me a liar when I put my butter in the fair as uncolored. We lived that down and got along with a private dairy at thirty cents a pound. But the women get sick of that business; they want to have a man do their share of the work,—but Mr. Terry is going to talk about that. We found we had the best stock there was without a herd book and as good as there was with.

The superintendent of the Deer Foot Farm came and wanted to see my cattle. I went with him, took him around a part of two towns; showed him the stock that had been bred from that admixture without any scrub blood and he was pleased. Mr. Cheeseman knows what good stock is I supposed he was going to buy young stock from us;—they called these Alderneys. I think they were Guernseys for outside stock, it was red. I supposed he was going to buy. He said, "We want a place not more than seventy miles from Boston, where we can make better butter than we are now making from our stock in Massachusetts. I want to bring Mr. Burnett here in a few days." He came with Mr. Burnett and that was the beginning of what is called "The Guernsey Dairy" at Contoocook. Our *dollar* comes once in thirty days and we are going to try and do as other people do, enlarge our number of dairy cows. This is nothing more than you can do here; you have good Jersey stock; and I know of no way in which you can get that dollar so well and so satisfactorily as in combined effort at some kind of dairy product.

I found I must have more money. I used to get occasionally money from my sheep or from selling a pair of steers; but I get my check from that Guernsey dairy every thirty days. It is better to have one or two or more ways from which to draw regular checks.

Ques. Do you get more money since you went into associated dairying than in private?

Ans. If I could have made business enough at thirty cents a pound, that was well enough; but that kind of business is usually limited. I was limited in the making of such butter and also in my customers. I don't know how much I might have increased my customers.

Ques. You increased your number of cows?

Ans. I intended to double the next year. I have been selling hay for three years because I didn't know of any better way. I think I can double and treble my stock. I got some of Dr. Boutelle's stock down here close by you. He brought some stock to our state fair. I said, when I can find registered stock just as good as grade I will buy. I got into Dr. Boutelle's pen and looked at a calf. They asked sixty-five dollars. I believe I can tell a good cow, or pick out a heifer that will make a good cow. That heifer proved to be a nineteen pound cow. Mr. Walker of Worcester, Mass., said it was the best cow he ever owned. If you have stock not good for dairy purposes, sell that and get some you can grade up. It is going to take some time to make three crosses, and bring up to maturity. I think you ought to sell some cattle which are worthy only of death and buy better and grade up. Farmers should now combine and put their milk where it can be handled in a mass. There is real satisfaction in taking twenty-four cents a pound and bringing back the skim milk. If you can do as well as that, your business will not be limited as in private dairies. We are pleased with the Guernsey dairy and hope to increase our business and have more *dollars*; see better times and make an advance all along the lines.

Ques. About dairying. The question is raised in many instances as to how long it will take to overdo the market. We would like to hear from Secretary Gilbert on that question.

Z. A. GILBERT.

Ladies and Gentlemen: The question of over-production has been raised many times and I don't object to entertaining it for a few moments. I have been a dairyman ever since I was a man for myself and there hasn't been a year but that question has been raised; whether the business is to be overdone? I have carried on the business up to the present time and we are no nearer overdoing the business to-day than when we started twenty or thirty years ago. When we stop and look over the situation;—I am so constituted that I cannot consider a question without looking on all sides of it and I am unable to discover that the day is at hand or in prospect when this business can be overdone. We don't claim that there is a bonanza in this line. I don't know of any business in shops or stores that will give a fortune without capital invested and a great deal of effort put with it; still it is a good paying business; hence the Board of Agriculture feels itself authorized to encourage its extension here among us. I believe, and we have evidence growing on every side, of the fact in proof of this, that it is good business for us as farmers to engage in. Now if we increase it largely, do we find our markets or prices lessen in consequence?

Do you know, that in spite of all the talk of the board of agriculture increasing the production of butter and cheese in our State during the few years past, that since the month of July our butter factories from one end of the country to the other haven't been able to supply the orders. There hasn't a single factory which, since August, has been able to supply its orders. We are hardly making butter enough to supply our own demands in this State. For a little while in the spring, may be June and July, we are doing a little more than supply the demand here in our own State. Later on, we fail to supply our own wants in this butter matter. Only one-fourth of the people in the State eat cheese. It is not made. That sent in from other places is poor and we go without it. We don't begin to supply the cheese wanted in our State. Yet we fear that the dairy will be overdone. We have the best markets within our reach in the country. Boston and New York are great markets; but scattered out in these towns where thousands of non-producers are located all through the Eastern States, how much of that butter goes to the Boston market from the State of Maine.

We have never sent butter enough from the State of Maine to make a quotation in the Boston markets. And right in the face and eyes of that fact, come whole train loads of butter from Iowa to Boston every week. How long have we to talk dairying in the State of Maine before we can load a train with butter to Boston. As soon as we can fill it, we can crowd out the Western States and take the money they are receiving now. The amount the State of Maine can produce, provided we should extend the business to any limit you please, would scarcely weigh a feather in the great average supply that comes into the cities. If so, it would have no influence to depress the markets in any degree. The amount of butter we are throwing upon the market is so small compared with other sources, it does not in the least influence the market. Just so in other products that can be named; it is no more so in dairy than in other products. Suppose all men should go to raising grain; cover the fields with a crop of grain. Could you glut the market? If you think so go and travel over the Western States, where there are whole states; where three-fourths of the entire acres are in grain; then think of the little we can raise in the State of Maine. We need never hesitate over any of the products with regard to this matter. Besides there is no very marked increase in production.

We hope it may be so in the future; but as yet there is no marked increase. With all the factories in the State, it has increased but little in amount. It has changed the business from private dairy work to co-operative work. A few have increased their stock of cows; but there has been no considerable increase in any section of the State. We hope it may increase the business in our State. There is enough to encourage farmers to take hold of it in full faith that they can increase their prosperity; that it will build up the condition of their farms into greater productiveness than is now realized; especially in this section, where the practice of selling hay is carried on as in many sections of this State, particularly in Kennebec county.

I wish we might have had time to go into some illustrative calculations with regard to the profits of the business, or the income that may be realized from a well conducted dairy business, either private or co-operative. But we have other work on hand to-night.

There are a good many here who are selling hay by the hundred tons; many of you now are selling hay. You claim to be making well out of the sale of that hay. Now I don't question it; but you can take that hay and feed it out to good cows on your farm, work up the milk into butter by co-operative methods, which takes the labor all out of your own hands, put it into the factory and realize from the feeding of that hay more net cash than you can get by the sale of the hay. We have the figures; we have the facts that can be brought forward to prove this statement. Meanwhile you can purchase grain in more or less measure to put with that hay to do the necessary work of production and get a full return from the outlay; thus receiving in the form of dairy product, the market value of the feed consumed by your cows for the result. The manures are left on your hands without cost on your farm. That is being done by whole communities in this State. It has been done in private as well as co-operative dairying. We have the records of the factories in proof of this statement.

In a community of farmers, in order to carry on this kind of business, all that is necessary is intelligent application to the business; conduct it in a business-like manner; select your stock with judgment; feed it as you well know how and reap these results from the effort. It is surprising to me that more of our farmers don't adopt these special lines. We are inclined to be slow to change our methods, our work; and I would not urge any one to do so, unless it was made plain and clear to them that they could benefit themselves by so doing. I feel confident if you investigate this matter, you will find these statements sound and that they would not mislead any of you if you accept them. If there is any question, I would like to hear it.

Ques. What is the average price for butter at creameries?

Ans. The average price received for butter at the creameries for a year; we have the figures from some creameries in the State. These prices vary with different creameries, in consequence of location, situation and especially the *management*. At our creamery (North Turner) the last year's operations were the lowest we have had for many years. The low price of butter crowded the average down for the year very low. Our creamery averaged us a little over twenty-one cents for the year, after paying the outlay of repairs on the factory, some over five hundred dollars, paid in butter. This is the net paid to the makers of the cream; the patrons of the factory. Some creameries paid a trifle more than that. The prices this year have been considerably better; the winter months will carry the average considerably above last. The average for 1890, was the lowest we have ever encountered. But my statement holds good; figure your butter at a net of twenty cents a pound, and it will leave you a handsome margin above my statement. Twenty cents a pound, with a cow that makes two hundred and fifty pounds of butter a year, without figuring the calves and skim milk, will more than pay the cost of keeping in cash value of product. Two hundred and fifty pounds at twenty cents, gives you fifty dollars a cow. With the price of hay as low as the past year, you cannot figure the cost at fifty dollars; but two hundred and fifty pounds to a cow is a low average where attention has been given to the quality of the animal. Dropping out all the poor ones, you will find it easy to reach three hundred pounds to a cow. The cost of keeping that cow is scarcely increased; and in place of fifty we have sixty dollars. I got the figures yesterday of a gentleman who commenced this business three years ago. He was induced to do so by the representations of a lecturer at a meeting of this kind. He told me that these three years, from his first start in the business, he had secured a trifle over three hundred pounds of butter per head from his herd of cows. A member of the Board of Agriculture who was with me last week, gave me his figures for his herd. His cream went to the East.

FARM DRAINAGE.

By MR. JOEL RICHARDSON, Newport.

Read at an Institute held at Buxton, December 11, 1891

Draining is the first step in any good system of farming. It deepens the soil, lengthens the season for labor and vegetation, precludes the necessity of replanting, promotes the absorption of fertilizers, admits air to the roots of plants, and, although at first thought it appears absurd, tends to prevent drouth. These facts are established beyond doubt by many experiments. It deepens the soil by allowing the air and roots of plants to go much deeper than when it is full of water, both of which assist in decomposing and pulverizing the hard sub-soil and making the elements of plant food available. It lengthens the season by removing water earlier in spring so as to bring the soil in good condition to plow and plant much earlier and is not so much injured by fall rains It promotes the absorption of fertilizers by making the soil more porous. It admits air which is absolutely necessary to roots of all plants, except those known as water plants, few of which are of value to farmers. It increases the warmth of the soil by more readily absorbing the heat of the sun, it also prevents the cooling effect of evaporation of stagnant water from the surface. In the northern states with short seasons the warmth of the soil is an important factor in plant growth. It tends to prevent drouth by making the soil more porous and allowing the roots to go deeper for moisture when the surface becomes dry. Moisture will also rise by capillary attraction through porous soil much better than when it is dense.

Swampy lands must be drained or remain useless to the owners. These are usually our most productive lands when properly drained. Each farmer must be his own judge as to whether it will pay to drain. But do not decide the case before you investigate and get all the evidence for and against that you can obtain, for if you do you will be likely to decide against your own interest because it is much easier to let drains alone. High lands holding too much water at any part of the growing season should be drained, as most useful plants are drowned by being covered by water even for a few days and by the roots standing in water. Undulating lands through which are many crooked wet runs which cannot be plowed when the rest of the field is ready should be drained, for by so doing they are ready for the plow as early in spring as the high lands around them and as they have been receiving the wash from the lands above them they are much richer in plant food. Indications of too much water in grass lands are growths of rushes and water weeds; in grain and corn lands, small sickly looking plants. Drains on nearly level lands having a slope in only one direction should be laid directly down the slope. But on a valley sloping inward and downward one main drain through the lowest part with side drains coming in from each side is better than several long drains. A fall of one inch in a rod is sufficient and a fall of two inches is better than more. The fall should be as uniform as the nature of the ground will permit. Ways and means of grading the bottom of the drains will be explained further on. There are three modes of draining to which I wish to call your attention. Each has its merits on lands of different kinds and values, surface drains, under drains of stone, and under drains of tile pipe. Surface draining should be done only when the nature or value of the land will not permit of better but more expensive methods of underdraining. It is often necessary to make temporary drains to remove water from spots in fields we wish to plow in spring, also often through the growing season after heavy rains. Surface drains may be made to remove water from low places in pastures so as to produce feed where there would be nothing but bushes but which would not warrant the expense of a good under drain.

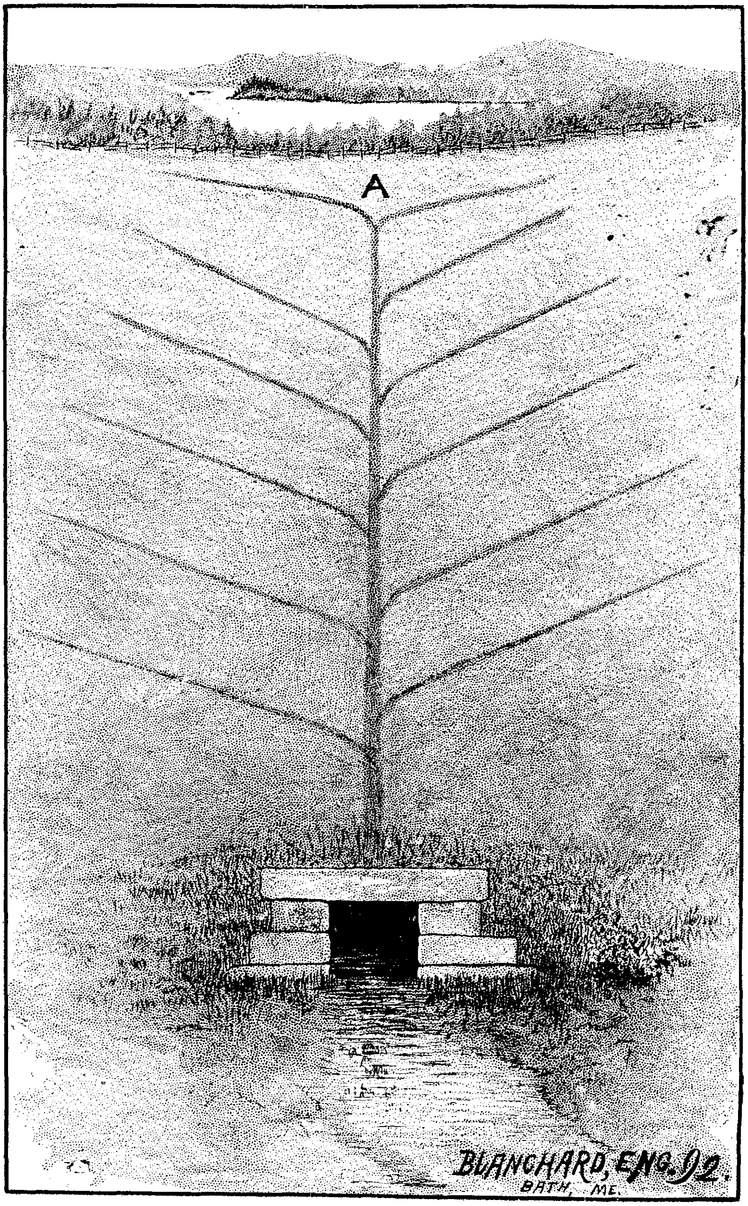
Very flat lands can be best drained by plowing in beds so as to leave wide open drains. Such lands even if provided with good under drains cannot carry off the winter rains when the ground is frozen. If such lands are not provided with surface drains the winter rains will freeze over the surface and the ice excluding the air kills out the grass.

There are several objections to surface drains, some of which are serious obstructions to driving over the fields. They generally grow a crop of weeds to seed the adjoining lands and are continually carrying off with their waters the finest and best particles of soil which they drain.

Deep, well constructed under drains are subject to none of the above objections. The water falling on the surface percolates slowly through the soil to the bottom of the drains giving up to the roots of plants and the spongy soil its ammonia, carbonic acid and other elements of plant food as it passes downward and is followed by air, bringing other plant food which is also given up to the roots and soil. Stone drains may be made on farms where small stones are abundant without any cash expense and the work be done by the farmer and his team between haying and fall harvest without interfering with regular work of the farm. A stone drain if well constructed will do good service for indefinite time. I have such drains doing good service now that were laid twenty-five years ago and I can see no reason why they may not for a hundred years to come. Depth of drains should not be less than three feet, and four is better, so as to be entirely below the plow and the frost, as anything that disturbs the soil near the bottom is likely to obstruct the drain. Drains down steep slopes are liable to be injured by slight obstructions or excess of water backing up and producing pressure enough to burst upward, which leaves a hole, and as the water falls away the earth washes downward and stops the drain. As to distance between drains the rules laid down by most writers are discouraging.

If as they say drains must be within twenty or thirty feet of each other, there is but little land of sufficient value in this State to pay for draining. But I have nearly a mile of stone drain doing good service and know that there is no need of drains being so near. Of course the depth of the drains has much to do with the distance which they will draw the water. In loam soils a three and one-half feet drain is sufficient for four rods on each side. In dense stiff clays of course they must be nearer. On lands which receive much water from other lands above, one head drain across the upper part of the field with a drain from the lowest point of such head drain down the slope will entirely change the condition of the whole field below. If a drain will draw four rods on each side, twenty rods of such drain will drain an acre. There are few situations or soils which cannot be well drained by forty rods. The cost of drains differs widely from different degrees of hardness in digging, different facilities for filling, different sizes of drain required to accommodate the flow of different volumes of water and also in the judgment and push of the men who make them.

With me the average cost of stone drain has been about one dollar per rod. Where land is cheap forty dollars per acre seems a large sum to lay out in draining. But that sum is often expended in moving stone from an acre which does not make the land more productive, while draining does.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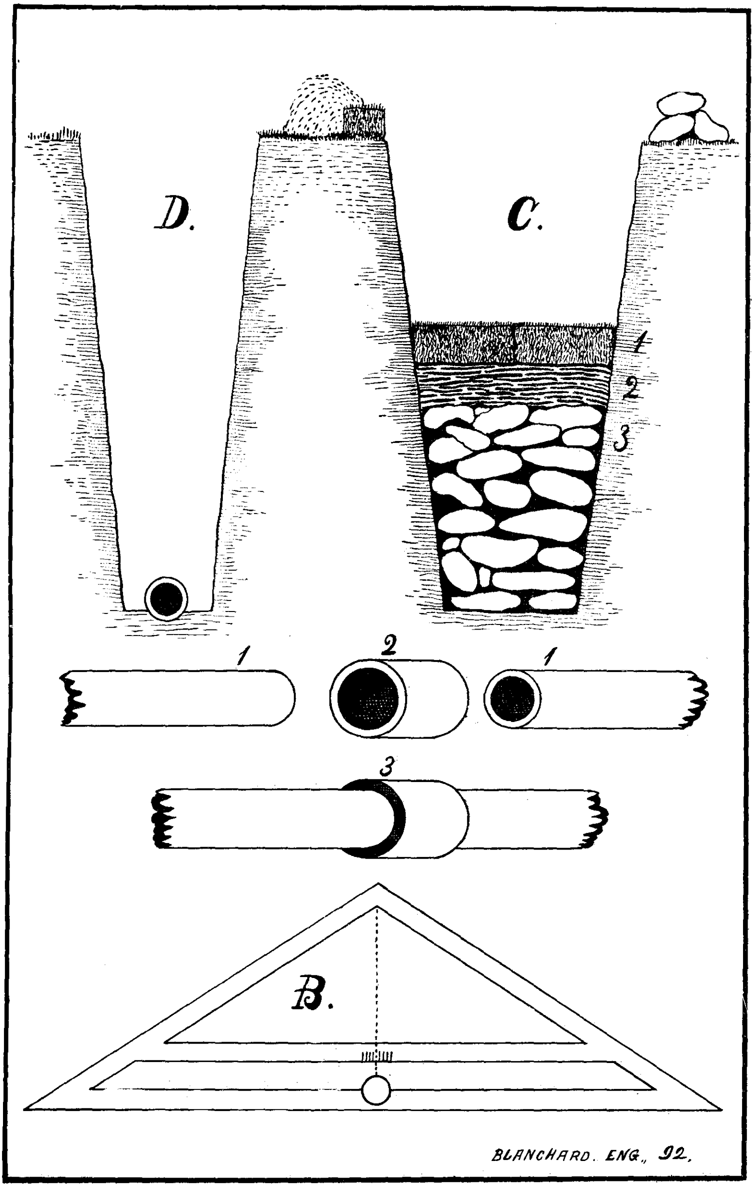
If your land to be drained is a valley sloping downward and inward lay out your drains as in figure A. Drive stakes at the ends and angles. If your drain is to be of stone, three and one-half feet deep, it should be two feet wide at the top and one foot at the bottom. If of tile it may be as narrow as is convenient to work. Take your team and plow, turn a furrow as deep as the plow will work. Drive back to the place where you began, let out your chain, and let your plow down in the bottom of the first furrow as deep as it will run, then go back and turn another furrow on to the first. Plow in the bottom of this. If you have a subsoil plow you can go a foot deeper. Cut the sod in pieces that you can handle and lay them on the edge of the land all on one side. Throw the earth over the sod, and the stones which you take out on the other side. Make the sides of the drain as straight as you can and the inward slope uniform as practicable. Also grade the bottom as uniform as the ground will permit. This is best done by span figure B. Take two pieces of straight board five inches wide, put them together like a pair of rafters so as to span sixteen and a half feet and rise five feet. Four feet and an inch and a half from the top nail a stay. Set this on a level floor droop a plumb line from the apex, mark where it crosses the stay, then mark several marks on each side of this one-half across the stay and one-fourth inch apart. Set this in the bottom of the drain and note where the line crosses the stay. Each one-fourth of an inch from center line shows a fall or rise of one inch in a rod. Commence at the upper end to fill the drain. Dump in small round stones; none larger than a two quart measure. Fill to within two feet of surface. Level to grade of the bottom of the drain. One and a half foot of cobble stone is better than any culvert you can lay unless it is masonry or tile. Cover the surface with thin flat stones, if you can get them, lapping one on another like shingles, being careful to drive them into the walls of the drain. If no flat stones, cedar bark shavings, long sawdust or spruce boughs will do to keep the earth from rattling downward through the stones and obstructing the drain. On this, place the sods, packing them close and treading them down. Throw in five or six inches of earth, tread this hard, being careful to pack close to the wall, as the earth is apt to shrink from the walls and let the water run down from the surface carrying the dirt among the stones and spoiling the drain. After this is well done the rest of the filling may be done with the team and scraper.

Figure C shows a section of such a drain after the stones are in and covered with shavings and sod and before the upper part is filled. 1 is the sods and packed earth; 2 is the coat of shavings and 3 the stones. Figure D shows a section of tile drain. The laying out and digging for tile drain is the same as for stone drain except that it is not necessary to have them so wide. Drain for tile should be graded very even at the bottom, finished with a round scoop shaped tool. Use round tile and take nothing else whatever dealers may say. Have a collar for each joint. These need be nothing more than short pieces of larger tile. Figure E shows tile, 1-1 showing pieces of tile separate, 2 shows collar, 3 shows tile joined with collar. After the digging is done put one-half inch of sand or fine gravel in the bottom. Begin at upper end of drain, lay the first piece pressing it into the sand so it will bear in every part. Put on a piece of brick over the hole in the upper end. Then put on the collar, then another tile until all are laid.

Have a good fall at the mouth of the drain so that silt will not accumulate and back the water up into the drain. Make a stone arch at the mouth and cover with an iron grate to keep out woodchucks, snakes and frogs as shown in figure A. After laying the tile, fill in four inches of sand or fine gravel; then fill with scraper. Level the earth so that it will be a little higher over the drain than on each side, as it will settle more there. Be sure that you lay none but hard burnt tile, as one soft tile which crumbles away ruins the whole drain. No work is perfect and drains will sometimes get obstructed, but if well done they may be considered a permanent improvement adding to the value of the land for all future time.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THE FARMER'S GARDEN.

By MR. A. W. CHEEVER, Dedham, Mass., Agricultural Editor, New England Farmer.

According to the Bible account of the early history of the world and of man, it would seem that the Creator looked upon a garden as one of the chief essentials to man's happiness, for in the seventh and eighth verses of the second chapter of Genesis we read, "And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life." "And the Lord God planted a garden in Eden; and there he put the man whom he had formed." If this account is correct, the custom of planting gardens had a very respectable beginning, for the first garden was planted by the Creator and the first human pair adopted gardening as their vocation. But even in those early days the sons did not all seem to fancy the business of the senior member of the family. Adam appears to have been successful in making a farmer of his first born son, Cain, but Abel, like many another country-bred boy, left the old homestead and went into the mutton and wool business. How successful he would have been had he lived it is impossible for us to know, neither do we know whether Cain, as a farmer or gardener, was an improvement or otherwise on his illustrious sire. We do know, however, if the record can be relied upon, that when Cain brought of the fruit of the ground an offering unto the Lord that the Lord showed no respect either for him or his offering, but for the first fruits of the flocks of Abel he did have respect. Possibly some of the farmers' sons who have left the paternal roof to strike out in some new industry may have seen in this account a dislike on the part of the Creator for the tiller of the soil and the fruits thereof, but I prefer to put a different interpretation on the narrative. I think that Cain must have been a little negligent in the care of his grounds and crops. He may have made a poor selection of seeds, or he planted them on poor soil, or failed to properly plow and cultivate it; he may have spread himself over too much land putting a little manure in the hill when he should have spread it liberally broadcast. Very likely he didn't half hoe what he planted but let the crops get over run with rank-growing, worthless weeds. Perhaps too, the weather didn't quite suit, or the tariff at that time wasn't adjusted to his individual ideas and so he got discouraged and argued himself into the belief that farming "doesn't pay." If this really was the condition of our first brother or greatest great-uncle I am not surprised that he got beaten at that first world's fair and agricultural exhibition. His exhibit was unworthy the respect of the Lord God who was acting as judge at that gathering. Cain was evidently a poor gardener, and he failed to instil any love of the business into the members of his family for it seems that his eldest son, Enoch, as soon as old enough to do business on his own account went off and builded a city. He probably saw more money in house lots than in garden vegetables.

But Adam's immediate descendants were not the only members of the race who have failed as gardeners. Even now there are a great many men, particularly among farmers, who look upon gardening as pretty small business and only adapted to those who like to putter.

Too many farmers look upon the garden as something of secondary or minor importance, something to be attended to when everything else is disposed of. But farmers' wives who have the table to supply usually take a very different view of the matter. I well remember the anxiety of my mother in regard to garden operations every spring, and I remember equally well how my father always wanted to let the garden go till the field work was all finished.

The oats must be sown early or they might blight; the corn and potatoes must be attended to in season or the crop might be reduced, but the garden was of little account anyway, and it made little difference whether peas and cucumbers were on time or a week or so late. They would taste better if waited for a while and then there was less risk from loss by late spring frosts. In my boyhood days the idea of having fresh vegetables all the season through had hardly entered the heads even of the most progressive. Glass in garden culture was almost unheard of. So were many of the varieties of gorden products now so common as to be considered almost indispensable. My father's garden contained early potatoes, peas, beets, pole beans, cabbages, cucumbers, squashes, both the summer and winter varieties. There were few peas known then except the tall growing varieties that required bushing and scarcely any valuable varieties of bush beans.

Forehanded farmers provided bean poles and pea brush in winter when securing their year's stock of fuel, but others neglected this till they were wanted in the hurry and drive of the planting season. Under these circumstances a day's work in the garden made little show compared to field work. There was also much unnecessary puttering in the garden. My father's beet bed was much like the beet beds of all his neighbors, a mound-like square of loose earth with a narrow path around it. The rows were about six or eight inches apart, the furrows were opened with the finger, the seeds sown, the earth replaced by hand and patted down lightly, or a board was laid across the bed and the weight of the body used to press the earth and leave a smooth level surface. In some gardens this square bed would be extended to a parallelogram and give room for a few rows of carrots, parsnips, top onions or peppers and possibly some pot herbs. Sometimes the flower garden monopolized one end of such a bed, and yielded its choice product of marigolds, poppies and four-o'clocks. These raised beds were quickly dried of their moisture in a dry time, and seeds often failed to come up well, and the weeding was nearly all thumb and finger work, while reaching in from the narrow paths, and was so dreaded, especially by the boys, that it was usually left till the tiny plants were badly shaded by the stronger weeds.

These mellow beds, when first planted, offered great attractions to hens and chickens, which nobody thought of keeping confined in those days. Hens didn't pay, it was thought, unless made to roam the premises and forage for themselves. My earliest recollection of a garden was a little fenced-off patch or corner of the "door yard," I should think about four rods wide by five long. Later on, to escape poultry depredations, one of similar shape and size was walled off in a distant field, but the walls made such a harbor for woodchucks that the crops suffered quite as much as when planted nearer home and within range of the poultry. The popular idea of a garden seems to have been a small piece of land by itself, enclosed by some sort of a fence. In rocky sections this would be of stone, making a harbor, not only for woodchucks, but for all sorts of vermin, weeds and insects. The large, black squash-bug asks no better protection in winter than is afforded by the garden wall, and I should hardly know where to look for a better illustration of the idea of eternal life than in a patch of witch-grass strongly intrenched in the rich soil intermingled with the cobble-stones of its straggling foundation. Some forms of wooden fence are preferable to stone, and are a better protection against poultry; but I want no fence at all around a garden. I long ago learned that I could afford to maintain no cross fences in my cultivated fields because of the increased cost of cultivation. If fences can be dispensed with in field culture then they certainly can be in the management of the garden. No one can afford to grow garden crops in a small enclosure where in plowing and cultivating it takes more time to turn the corners and loosen up the soil trodden down by the team than to do the work in the middle of the yard. Fences should be built to keep poultry and other farm stock *in* their allotted quarters, and not specially to keep them *out of* the corn field or garden. With poultry well secured in suitable yards, and cattle and other domestic animals confined in stable or pasture, the cultivated portions of the farm, including those devoted to garden crops, may all be in one great field, either with or without roadside enclosures. I prefer the latter, both on account of the reduced cost of cultivation and because of the enhanced beauty of the landscape.

The only intruder I would fence out is the cold north or west wind and this I would keep out with board fence or living evergreen hedge according to the value and extent of the land to be protected. I prefer to live where land is cheap enough so I can afford to grow what hedges are needed for wind breaks. They are beautiful in themselves and may pay their own cost in the fuel furnished when their harvest day arrives. I want no spot set apart for a permanent garden on a farm. Judicious rotation is as necessary to success in the growth of garden crops as it is in the products of the field, but we can never afford to plow in crops to lighten the soil when the furrows are scarcely more than three times the length of the team. Neither do I consider it important that all the garden crops, so called, be grown in a bunch by themselves, however convenient such an arrangement might be were everything favorable to carrying it out. The climate of New England is exceedingly variable and uncertain. We can never know in spring whether the summer will be wet or dry, cold or hot, so we can never know with certainty whether to choose a dry spot or a moist one for a given crop. To make assurance doubly sure I would have at least two separate areas for garden crops, one the earliest and dryest spot I could find for the hardy, early crops and another so damp there would be no danger of losing a crop however dry the weather might be. The most successful gardeners around Boston all aim to have these extremes of soil if possible, dry sand and low meadow, and these are the men who usually have their porringers right side up when it rains. If the weather brings a partial failure in one section they make it up on the other. Having discarded the garden fence there is no longer any excuse for the short rows and small beds of the old-fashioned garden.

I should say plant everything in rows and have the rows as long as practicable and so far as may be, wide enough apart for horse cultivation; then it will cost no more to grow a bushel of sweet corn for the table than a bushel of field corn for the pigs; no more to raise a barrel of table beets than a barrel of mangolds for the cattle. A certain neighbor of mine never had any "luck" with beets so long as he planted them in the old-fashioned way in raised beds, though he spent twice the labor that he did later when he sowed the seed in one long row by the side of his corn field. Another neighbor raises his strawberries in the same way, and they cost him so little that he never feels it. His plants are set in a single row on one side of a large cultivated field. They are hoed and cultivated when the rest of the field is worked. The following spring a new row is set from the runners which are always at hand and so the bed is enlarged on one side and the old plants turned under when past their usefulness on the opposite side. In this way an abundance of berries are grown and as cheaply as cabbage or potatoes.

My ideal garden would be a sandy loam, of suitable size, sloping to the south and extending down into a well-drained peat meadow. On the upper side of this I could plant a few rows of early stuff about as soon as the snow was melted away, adding other rows as the season advanced and ending with such crops as would do best on the re-claimed meadow, or such as must have a continuously moist soil for successful growth. Occasionally such a spot can be found but most of us must select suitable land for different crops in places more or less disconnected, but however scattered the farm garden may be let the rows always be as long as practicable to decrease the cost of cultivation and allow most of the work to be done by horse power. The farmer has an advantage over the small village gardener in that he can select soils and situations for his various crops with greater satisfaction and ease. If certain crops require old, fine soil that has been under clean culture a long while, the farmer can have it. If other crops succeed best on new land recently in grass he has that too. He can also use the plow, the disc harrow and the heavy roller with a great saving in expense over the methods that must be employed in the small village garden. Indeed, nearly all garden crops may be grown by farm methods as cheaply, with the possible exception of one weeding of small plants, as ordinary farm crops are grown. We ought to realize more than we do that farm soil should be as rich as garden soil and farm cultivation as thorough as garden cultivation. If it will pay to manure heavily for garden sweet corn, it will pay to manure heavily for field corn. If we can afford to raise large crops of potatoes per acre in the garden we can afford to grow equally large ones in field culture. If one hill of cucumbers or squashes will pay for extra manuring and attention, a whole acre will pay equally or proportionally well. If a good garden soil will pay better producing two crops per year then one crop, then the whole farm should be made to grow two crops.

A good garden has a deep, mellow soil, so has a good field. A good garden is free from rocks, stumps and other obstructions to cultivation; so is a good field. A good garden is drained either naturally or artificially so that the crops grown will not suffer by too much water; so is a good field. I think the distinction between gardening and farming as understood by many persons should be abolished.

And yet I am here to talk about farmers' gardens, and if the term means the cultivation of those crops, vegetables and fruits, designed specially for the farmer's table I have no objections to the use of the term, and if there are men who do not believe it will pay to cultivate a whole farm as well as a garden should be cultivated then I should say let them give the garden extra care and make of it all that is possible and gradually learn as they surely must, that good work pays just as well on a large as on a small scale. There are a few garden products like rhubarb and asparagus that can not be grown here and there about the farm with other crops but require a permanent location.

But in fitting the ground for these I would treat it just as I would for an annual crop. The old notion that an asparagus bed must be dug over two or three feet deep and the soil from top to bottom stuffed with strong manure is a false notion. No land can be plowed with comfort till cleared from stones as deep as the plow will run, and any land that can be plowed deeply can be fitted for asparagus without trenching it with spade and pick. If the soil is rich enough for other crops like corn or cabbage it is rich enough for starting asparagus. The after treatment of an annual covering of stable manure or commercial fertilizer will supply all the food material the crop will require and it will place it just where it will do the most good. I have no confidence in manure that is buried two or three feet under ground. I believe the feeding roots of most plants are comparatively near the surface and within reach of heat and air. Asparagus, too, should be grown in long rows and cultivated chiefly by horse power. Inexperienced persons always set it too thickly in the rows and get the rows too near together. A good plant well established will easily occupy all the space within a circle four or five feet in diameter, and if given that amount of room will produce much larger stalks for cutting than if crowded into a space of less extent. To avoid tedious finger weeding I would buy one or two year old plants instead of starting a permanent bed from seed, though I have been quite successful with plants started early in a hot bed and transplanted in midsummer to the permanent location. In this way I have the early part of the season for preparing the ground by manuring and repeated cultivation to kill weeds. Then the plants have two or three months for growth in late summer and fall.

The plants should be set deeply enough so that a good cultivator or small plow can be used over the entire plantation once or twice a year without disturbing the plants. Some plants tend to bury themselves deeper from year to year, while others work up nearer the surface; but asparagus remains about where it is planted. The annual covering of stable manure should fully offset all influences of wind and water in wearing down the surface.

If asparagus is pushed as it may be, it will afford some cutting the third year from planting, but the largest stalks will require at least four years of root growth.

When I use manure for fertilizing I put it on thickly late in autumn and let it remain undisturbed, or merely raked over once in spring, till I am through cutting for the season. The strength of the manure gets washed down among the roots, and the strawy substance remaining gets so dry in the spring that very few weeds start to cause trouble. When through cutting, the ground is thoroughly cultivated between the rows and lightly immediately over them.

The cutting should not be continued so late as to greatly weaken the plants. There must be time for mature, healthy growth of top, or there can be no strong roots for throwing up large stalks the following year. Different people have different tastes, but I can hardly see how any farmer, with a family to provide for, can afford to be without two or more long rows of asparagus. A large milk-panful of the quickly grown stalks in the hands of a good cook will help make a meal in May or June that many a city epicure would willingly pay well for.

Another perennial that needs a permanent location in the farmer's garden is the pie plant. It is of less value perhaps than asparagus as a food, but coming as it does so early in spring when the stored winter apples are gone or badly wilted and flavorless it fills a gap that nothing else can. And then it is so easily raised, a very few plants being enough to supply a large family, provided it is well cared for.

Rhubarb requires a moist soil and abundant manuring. If it can be set just within the benign influence of a respectable sink-drain it will make good use of its chemical laboratory in changing waste material and soil moisture into a wholesome and palatable food, but it must not be set in the mud or allowed to be submerged in filthy water. I suggest the vicinity of the sink-drain because even at quite a distance and on higher ground, the movement of moisture through the soil by capillarity would keep the plants growing all through the season. Rhubarb is used mostly in early spring in the absence of other pie material but it is good any time if pulled when in active growth. The roots need taking up and dividing after a few years unless the growth is kept within bounds by close harvesting. The plants need abundant room to produce large leaf-stalks, the only kind busy house-wives like to handle, for it is much easier to prepare a pound of pie filling from a single stalk than from a half dozen. The large ones, too, are always the more tender. Tough rhubarb is not in demand. About the only care the plants need is to keep the ground free from grass and weeds, to pull out the seed stalks as fast as they appear, to keep the growth confined wholly to roots and leaves, and to cover the ground annually with a good coat of manure before winter sets in.

Both asparagus and rhubarb may be forced in early spring by covering the plants with hot-bed sash and packing horse manure around the beds. If some member of the family is sure to always be at home during the early spring months a hot-bed is a very pleasant luxury to maintain but unless one is sure of such constant attention the growing of hot-bed stuff had better be left to others who can afford such confinement. A single hour's neglect in our variable climate may cause the ruin of the work of weeks.

If I had two boys to bring up on a farm—the best place, by the way, in all the world to bring up boys—I would certainly have one or more hot-beds in operation each spring. The management is readily acquired, and they will easily add several weeks to the farmer's profitable summer operations, either in growing money crops or supplying luxuries for the table.

Like much other garden work, preparations for a hot-bed should be made the previous fall. A common practice is to dig out a trench six feet wide and as long as desirable, and build a frame for supporting the banks and the sash which is to cover the bed. Fill the trench with leaves, if they can be obtained, and cover with boards to shed water and keep out snow and hard frost. In March shovel away the snow, remove the boards and leaves and fill in a foot or more of active horse manure, and cover with a few inches of good garden soil stored in a suitable place the fall previous. Then put on the sash and after a few days there is a small garden ready to be planted.

For more than twenty years I made my hot-beds give me profitable employment, as a farmer, fully two months each spring before the season would permit the growth of tender plants in the open air. Tomato plants were my specialty but I grew many other things both for sale and home use. Lettuce is very easy to grow in hot-beds in early spring and it adds greatly to the relish of what might otherwise be a dry meal. A lettuce temperature will also grow cabbage plants for early setting. As the season advances and the heat of the beds declines, a few hills of sweet corn and early bush and lima beans may be started in shallow boxes or flower pots from which they can be planted out without check when the soil of the garden is sufficiently warm. Market gardeners around Boston often double the profit from lima beans by thus starting them in gentle hot-beds. But don't go into hot-beds too extensively at the start for there is a good deal to learn and one is quite likely to lose his crops the first year by some unlooked for mishap.

My first bed was ruined by a hen and chickens after the plants were well started. Later on some of my plants got frozen but more were burned by the hot sun or rotted by too much dampness in cloudy weather. But after learning how, it was not difficult to raise plants enough in two months to come to from $150 to $200. There is room in every country village for at least one farm boy's hot-bed for supplying the local market for early plants, and a start in that direction naturally leads to a horticultural or market garden business. There is too much sending to the cities for early vegetables in every country town. They should be grown at home, thus saving express and commissions and widening the range of country industries.

But we must not linger too long among the hot-beds even though their contents do remind one of enchanted climes while the snow still lingers and Jack Frost holds a tight grip on the soil of our own out door garden.

I said preparations for a hot-bed should be made the fall previous. There is a good deal of garden work that may be done months beforehand. I would have a garden ploughed in the fall for several reasons. Weeds which grow late in autumn and early in spring and sometimes ripen seeds before the ground is fairly settled will be destroyed or so checked as to do little harm; garden rubbish turned under will rot by spring and help enrich the soil; the frosts of winter will have a better chance to act on the cruder portions of the soil and improve its agricultural character, and last but not least, many insects in various stages of development will be so disturbed in their winter arrangements that they will be dead by spring.

Then with the ground well plowed and manured as it may be the previous fall there need be no delay about getting in few rows of the hardier vegetables as soon as the frost is out of the ground in the dryest early corners.

Onion sets, smooth peas, lettuce, beets, cabbage, and some other things may safely be planted before the snows are through coming or the ground has done freezing. People may plant some things too early but it is an old saying and a true one, too, that those who plant early seldom have to borrow of those who plant late.

Every farmer should endeavor to find some small spot on his farm where a few hardy things can be put in early with comparative safety. A gravelly knoll, the south side of a hill or wood lot, so thin and dry as to be worthless in mid-summer, may produce an early crop of something that will pay well for growing. We are too apt to forget that we have nearly six months of growing weather between the two ends of winter, and yet many of our annual crops require scarcely half that time to complete their growth. If there is anything a farmer's wife hates it is an old, wilted, sprout-exhausted potato in early summer after she thinks she might have had new ones if her men-folks had only done their duty in early spring. To get new potatoes fit to eat from the first to the tenth of July every year is an easy thing to do in my latitude, farther north they would be a little later and the old ones keep so much better there that there is less occasion for hurry about getting new ones. Last year I picked potato blossoms from hills in my garden before some of the neighbors had finished planting. It is a very simple matter to start a few potatoes for supplying the table between the usual stock of old and new in the market. No hot-bed is needed. I have started them in hot-beds and then transplanted into the open fields many times but I like my present way much better.

The transplanted hills always get checked in their growth, and although they may produce a few tubers quite early, the crop is always small. A better way is to pick out a few dozen medium-sized potatoes and place them, closely packed together, in a shallow tin or box, all with the seed end up, and set them in the strongest light of a moderately warm room—a south window if there is one available. They should be placed in the window at least two weeks before it will be deemed safe to plant potatoes in the garden. The tubers will not throw out long sprouts in the strong light as they will in the dark cellar, but they will be warmed into active life, will turn as green, almost, as a green leaf, and will push out one or more short, stout buds or sprouts from the top end. Usually the central eye only will make strong growth, and this will be in breadth rather than in length. When the ground outside becomes fit to work in some warm, sheltered corner, get out the spade or plow and put it in condition for planting potatoes. Then with rather deep furrows set the potatoes one in a place in the bottom, being careful to have the bud end up, just as when in the shallow pan in the window; draw a little earth over and around the potato to hold it in place and keep it moist enough to encourage continued growth. The bottoms of the furrows catch the direct rays of the sun, while the sides keep away cold winds.

If a cold night threatens to freeze deep enough to injure the tubers or the sprouts, throw a little more earth over them. This may be repeated several times, if necessary, and all the time the future hill of potatoes has been busily making roots and gathering vital force to push its way with wonderful rapidity when the days become really warm. Ten days or two weeks may be easily gained in this way over the usual method of planting direct from the cellar.

For family use but few would be required planted in this way, but I have seen market gardeners put out acres of them and get well paid for their extra trouble.

Among the early products of a good garden the cultivated dandelion should not be forgotten. Until recently I had supposed it a difficult thing to grow and requiring the care of skilled gardeners, but with my few years' experience I find it as easy to grow as a weed; indeed it easily becomes a weed, though with me not a troublesome one. The difference between the improved dandelion as grown by the market gardeners and the common dandelion of the fields and door-yard, is quite as marked as is the difference between the little wild strawberry of a dry pasture and the choicest improved kinds of the garden. A very small area will supply a family provided the ground is rich and sufficiently moist. For very early use the plants must be under glass, but if a warm sunny spot be chosen a fine crop can be secured in the open garden very soon after the frost is out of the ground.

The seed may be obtained of seedmen, but once established in a garden it is easy keeping up a supply by setting a few plants each fall that have come up here and there from self sown seed. It is biennial in its habit and must make some growth the fall previous to being harvested. It would be a hearty person that could dispose of more than one well grown plant at a meal, a single plant often being larger than could be covered by a bushel basket. I find the dandelion much easier of cultivation than spinach for very early use.

I know there are men, possibly there are some present, who look upon these "greens" as something hardly worthy the name of food, especially for hard labor, but such should know that some of the strongest people in the world and who can endure the most are not meat eaters but subsist almost entirely on vegetable food. They should remember, too, that the strongest animals obtain their strength from "greens."

Animal food has been cheap in this country and we have become the greatest meat eaters of the civilized world but we have eaten it quite as much from convenience as from necessity. Salted meat is easily kept through heat or cold and it is easily cooked, which largely accounts for its almost universal use among the people of this country during the past century. But as population becomes more dense and land dearer there must be a change toward the habits and customs of older settled countries. Even now the meat bills are becoming burdensome in a great many families who could live better than they do and much cheaper if they but knew the value of well selected vegetable foods such as every owner of an acre of land can produce under his own eyes.

I have no sympathy with the stories that have occasionally appeared in newspapers reflecting on the character of farmers' tables. I believe that as a class farmers live as well as any other class of like means. There is no reason why they should not; and yet, it must be admitted that the stories of meagre tables are true in some cases, not so much from the want of means as from false ideas as to the comparative value and cost of a restricted meat diet and a more generous one in which choice vegetables and luscious fruits gathered from one's own grounds form a conspicuous part. Neither have I much sympathy with the too common notion that fruits and vegetables are unwholesome and can only be used with safety by adults with a stomach like an ostrich.

Ripe fruits and well-grown vegetables are not only capable of sustaining the laboring man but are safe for children and persons of sedentary habits.

Fresh sweet corn, eaten direct from ear or mixed with green beans in that most delicious Indian dish, "succotash," is a perfectly wholesome food if properly masticated, and when grown on one's own premises and picked as wanted for immediate use is not only an economical food but one of the easiest for the tired housekeeper to place before her family. There is no single product of my own garden that I value so highly in its season as sweet corn and I contrive to make the season a pretty long one. From the last of July to hard freezing in October I intend to have sweet corn in abundance nearly every day. Occasionally there may be a break of a day or two between the different plantings, but by planting every week from early in April to the first or second week in July and selecting varieties suited to the season there is rarely any lack of an abundance.

I might go on and describe in detail the methods of growing each of the many products of the garden so far as my own experience might enable me, but it might be tiresome, especially to many of you who are doubtless thoroughly familiar with such details. I have preferred rather to prepare a short paper treating upon the importance of the subject and the advantages of the farmer in being able to have the best there is in this line, and of obtaining it at an expense far below its actual worth.

The time has been that many farmers looked upon poultry on the farm as a sort of necessary evil, certainly not worthy the attention of the head of the establishment, but some persons have found out that a dollar or a day's labor invested in the care of poultry will or may be made to yield as large returns as if bestowed on larger animals or upon staple crops of the farm. I would have more farmers realize the value of a well managed garden and get rid of that old idea that the care of a garden and the production of these small things is small business and only suited to odd hours when there is nothing of more importance to attend to. Let garden work take precedence over field work. Be bound to have a good supply of vegetables and fruits for the home table even if there are a few less oats or hay or gallons of milk to sell at wholesale prices. Don't sacrifice the needs of the home to the needs of the farm. Let the home be the central idea around which all else revolves. Don't carry the farm as a load upon the shoulders but make it carry you. And if properly and intelligently handled, the farm garden with its abundant and varied stock of fruits and vegetables will contribute more to your comfortable support than any other equal investment you can make.

INSTITUTE AT NEW GLOUCESTER, DEC. 31, 1891.

WEDNESDAY FORENOON.

Meeting called to order by Hon. W. H. VINTON, Member for Cumberland County.

Gentlemen: The last legislature gave to the Board of Agriculture an appropriation for the purpose of increasing our institute work, and provided that there should be at least two holden in every county. We have already had one in this county this summer in Scarboro. Day before yesterday we had one in the town of Harrison, and now we have come to this old farming town to hold another. We hope we may be able to hold one in Freeport.

Now the question is, are these farmers' institutes thus holden, fulfilling their mission? Are they wisely expending the property of the tax payers of this State?

These institutes are designed to be educational; to induce our farmers to get out of the old ruts. We cannot run in the old ruts that our fathers and grandfathers run in;—everything must be promptly done; we don't expect to use such implements, such scythes, wagons and carts as our fathers used; we don't expect to live in such houses as they lived in; we don't expect to travel in the old stage coach.

The farmer must look to see that he keeps up with the grand procession, or the procession will leave him. This is the difficulty with the farmers; they are not keeping up with the grand procession.

Now these are times that call for study, investigation, comparison and science. It will not answer for farmers to argue as many have, that experience is the best schoolmaster; they know their fathers have had experience and their grandfathers handed down to them theirs in farming, and take to themselves great pride and glory that they are able to follow in such footsteps.

We must bring to our occupation, science, books of learned men; and when they come to talk with us and the farmers give each other their experiences, then these institutes fulfil their high purpose.

We are to talk about *corn*. I have a trace of corn here that I want to say a word about, how I raised it, but not now. Farmers must wake to the realization of the fact that they must raise corn instead of buying it. We need to raise corn, but in later days we have the idea that we can buy cheaper than we can raise it. Now think a little about that. Supposing we could buy it at twenty-five cents a bushel, and if we didn't have the twenty-five cents to buy it with, what then? It is not a question o price at all. The only question possible to the farmer is this: Whether he can raise or produce anything else which he can exchange for corn more profitably than to raise the corn. Because if the farmer does not produce something with which to buy corn and is buying all the time, where in the name of common sense will he be.

We must feed something to the cattle and if we haven't raised it, must run every day or two to the store or mill and if we carry nothing from the farm to exchange for it, we must put our hand in our pocket and pay for it or get it charged which is worse still.

Corn is one of the best and safest crops we can raise. I can tell you how I raised two hundred and twenty-five bushels of corn on one and a fourth acre; I have an exact account and know what it cost. I can do that very much better than I can buy it. Last year I was running after a bag of meal somewhere, almost every day, but shall not this year.

Mr. Cobb will tell us about raising twenty acres. I raised only one and a fourth acre and now, instead of going to the mill or store I go up chamber and get it. A town like New Gloucester should raise every particle of grain fed to the cattle;—we can raise more corn as well as not. I have not raised my corn for twenty years, until last year I thought I would try some. This last fall I plowed two and a half acres for corn next year. I don't find it difficult to enlarge my corn field.

Mr. Cobb of Poland, a stock man whom you know, will tell us something about raising corn and he knows what he is to discuss to-day.

CORN AS A FARM CROP.

By C. H. COBB, Poland.

Mr. Chairman and Gentlemen: In coming before you at this time, I know of no better language to use than that used by Prof. Jordan the other day at Harrison. A person in attempting to speak, should certainly be interested wholly in the subject upon which he is speaking or discussing. I am not coming before you as a school teacher, for I am well aware that every man knows how to raise corn as well as I; but the secretary has seen fit to pick me out to talk first upon the subject under consideration.

It is necessary, as you have all found by your experience in growing corn, first to get a warm dry soil. I should say perhaps, that there are but few farms in the State of Maine so well favored as those in the beautiful grass valley of New Gloucester. It is as necessary to pulverize the ground in a suitable manner as to deposit the seed. This is done easily now with the improved implements we have. How to tell which is the best mowing machine or the best plow or harrow is about impossible; as was remarked by the secretary, the man who has a plow he has used, that has served him well, is well satisfied that, upon that soil he is using it, it is the very best; while upon the soil of his neighbors it would not work as well. There might be some other better; so this matter must be left to the individual, after the work has been done with the plow and the soil well pulverized.

Ques. Supposing you tell us what good plowing is?

Ans. I turn the soil bottom side up. I know many are accustomed to turn the furrows up edgewise in the fall and in the spring turn them bottom side up fairly. Now this custom for the last two years has disappeared. In the fall they turn the furrows fairly bottom side up. I do that way. The crop that is realized from the ground when turned in this way, depends largely upon the way the ground is pulverized and what with. I would speak of the wheel harrow as a first-rate harrow. I claim the one is best that goes the easiest and that is the cutaway. This is an excellent harrow for most all soils, but in some places the spring tooth is much better. It is a great deal more of a leveler. Which one to buy is a hard question to decide if a farmer has but *one*, but if he has *both*, he is all right. He will use the disk harrow on certain pieces of ground and the spring tooth on another. After he has gone over the ground with the spring tooth, the disk harrow is nice to pulverize it more. When these have been used, the next tool that comes in our hands to use upon the ground to make this crop profitable, is the smoothing harrow. I don't care which it is; if as good as the Thomas, it is good enough. It is well known by those who have used it, that the teeth are reversible and it levels the ground and prepares it for planting. It not only fits the ground for planting but fits the crop for harrowing afterwards.

Ques. Do you want the other harrow to work deep?

Ans. I do; the spring tooth harrow will go much deeper than the smoothing harrow; so will the disk harrow. While this is being done the ground is being fitted for planting. As times used to be there was no need of this smoothing harrow; the common harrow going over the ground, then dressing in the hill where it had been furrowed and the work was done; immediately the ground was ready for the hand hoe and common horse cultivator which was used and used to perfection. Now, just before the smoothing harrow is used, what dressing is applied to the corn should be put on and pulverized deeply in the soil, as deeply as it can be done with the disk or spring tooth harrow. I believe in putting it in four inches deep; that can be done where corn has been grown more than one year. It is much easier to grow corn on the same ground year after year.

Ques. After you go over the ground with the spring tooth harrow, why do you put it on?

Ans. I will tell you a moment later. Now the ground is prepared in this way for the corn planter.

Ques. What is the best corn planter?

Ans. I don't care which you use if you have a good one. No man has planted with several kinds but has his preference. The secretary has one kind of planter and I another. I think mine is better than his; he will probably tell you that his is best. I wish to say, in growing corn, if you grow continuously on the same land, a light crop of dressing every year, is more profitable than a heavy dressing once in two years.

We get the best results from planting sweet corn about three and a half feet in the row and the hills made in two ways, dropping the kernel in drills eight inches apart. This is done with the corn planter with the smallest expense and the best way that corn can be planted in the State of Maine. There are now but few men in the vicinity where planters are used who do not use them. Occasionally one man is prejudiced against the planter and will not use it. It is planted at a dollar an acre much better than can be done with a hoe, and left as smooth as the floor when the corn planter is put on, but when we go upon it, we find the hills are lower than when we begun after the corn planter has been over it. In six or seven days you must take a smoothing harrow and go over the field crosswise; this levels the ground smooth again as before the planter was put on. In a few days after the harrow has been over it, you will see the corn breaking the ground. You will see that you have stirred all the earth, but at a shallow depth,—it is the only sure way to raise corn, to stir the dirt on the surface so as not to disturb the roots. In five or six days after it has been harrowed in this way, take the harrow and go over the rows lengthwise. This is done deeply because these harrows cover a large surface; that is to disturb every single weed that started from the effects of the manure, all except the wild rye or witch grass which has been bent down and checked but not exterminated.

Ques. Does not that disturb the corn?

Ans. Not at all; I don't think one hill of corn in an acre would be injured at this stage of hoeing; the ground is as level as it can be and free of weeds. The reason for not disturbing the corn is because it was planted by the machine and the roots are down deeper than the weeds on the surface of the earth. I have had neighbors borrow my harrow and wonder why it was so. I ask you, if you ever saw an acre, or a hill of corn planted by hand, that was placed down below the level of the surface far enough, so that in going over it with this smoothing harrow, you would not only *disturb* the corn, but take it out of the hill and land it somewhere else. When this corn is up about three inches high, some may be four, once more apply the harrow to it. If you hadn't harrowed this before, you couldn't do it now without injuring the corn; but by continually hoeing at this stage and age of the corn, it can be harrowed this time without any trouble at all. But *this*, is the last harrowing.

Ques. Suppose you undertook to use the smoothing harrow on a piece of rocks and clods of grass; would you recommend the operation?

Ans. It would make very poor work to undertake to work these improved tools one after another as they come. The first tool that is used on a piece of land must be a good one to use and the next equally so. One poor link in a chain, spoils the whole; so it is with growing corn. After harrowing three times this corn is free of weeds and ready to grow. The next time, take the cultivator and go through with a horse in a very light way, not very deep or you will disturb the roots. After this has been done about two weeks, which is usually about the 10th of July, then put the wings upon the cultivator, and if there is no witch grass it is not necessary to go over an inch deep. That is all it needs until after haying. I use the Champion cultivator. We can use that with a horse without hand hoeing at all. This is made at South Paris by S. E. Merrill. Another cultivator I have is entirely of iron except the teeth which are of steel. That has wings and is reversible to cover a hill of corn or a hill of potatoes. After haying, some weeds will come up quite large and I turn the soil toward the row the last time, and hill the corn just a little. The corn is large and shades the ground. Two men will go over two or three acres a day and get off the weeds that come up in the thin dirt. That is all the care the corn has. Potatoes are raised in this way, but the machine I use is a hand machine. Up to this time I have not used the hoe at all except after haying to destroy the few weeds that come up. Corn is often raised without any more hoeing than this. The other day at Harrison, the Secretary told plainly in figures which was the best crop to raise. I am not here to tell that, there is another speaker who will tell you about this,—continue this subject further with regard to the profits, the manner of growing and disposing of the crops.

Ques. Do you consider it necessary to hill the corn?

Ans. You cannot help it; I don't know of any way to destroy the weeds in the corn by machinery, except by hilling it; the wings throw the dirt and weeds in among the corn, you cannot help it.

Ques. Can you work the cultivator up among the corn?

Ans. Put the wings on so that they will come just as near as you can without destroying the corn. We don't do it for the *purpose* of hilling the corn but to cover the weeds. If the wings come too near, they will bend the corn and sometimes snap it off and it will drop down and die, or choke it and it will turn yellow and not amount to anything. Some will say that if you do not use a marker, it is hard to run the cultivator within an inch of the corn and not hurt it, but where it is planted with a marker, it is done easily. If I could get the weeds out of the corn without hilling it up, I shouldn't hill it. I drop the corn and phosphate all at once; there is no trouble in doing it. The fertilizer is distributed with the planter at the same time the corn is. Within a year or a year and a half there has been a great improvement about distributing these fertilizers, so they will come nearer under the hill of corn than formerly.

Now for the process of harvesting the three crops of corn. The first was the sweet corn, the second, the ensilage corn, and the third the yellow corn crop. In these days it is fashionable to raise sweet corn for the cows, to make this rich cream we have had presented here. While this has been done by some, the question is raised, what to do with this fodder? While the first necessary thing is to pick and carry the sweet corn to the factory; the next thing is, how shall we cure the fodder?

One way is, to cut it up, shock and dry it in the field and feed it out until about this time, December 28th, to the cattle. That is first-rate. It is better fodder to feed than is yellow corn fodder. I believe in curing it in the silo when you do not wish to feed it earlier than you would feed the silo. Now the average that I have from several factories this year, giving the amount of money paid per acre from the sweet corn crop, varies but little, from five different factories. Two paid forty dollars per acre as the average amount paid for crop of sweet corn, another paid forty-one dollars, and another a fraction less than forty dollars. This amount of money is received for the corn, picked and hauled to the factory. There is left this fodder in the field.

The last two years, owing to the low price of hay, it has been bought and sold for seven dollars and fifty cents per acre. This was considered a good, fair price; but other gentlemen say it is a rich thing at twenty dollars per acre. This gives sixty dollars that a man receives for an average acre of corn. About the best acre of corn that was raised and delivered at the West Poland factory, amounted to seventy-eight dollars and some cents, after paying the bills. The poorest amount a man received was the large sum of forty-eight cents for an acre of corn. We have for a pretty sure fact that an average acre of sweet corn will return to the farmer sixty dollars. There is another gentleman in this State who has planted nine or ten acres in one field. This corn has remained in the field until fairly glazed, then been cut up and weighed and found to yield fifteen tons of fodder and corn to the acre.

Now this gentlemen will tell you that he has found in feeding value, that two and a half tons of this fodder and corn was equal to one ton of good English hay. This cannot be cured in any way but to cut up for the silo, corn and all. It was hauled to the barn, run through an ensilage cutter and put into silo, making the nicest and richest feed for animals. Take fifteen tons to the acre. We call English hay ten dollars in the barn. Two and a half tons of this equal to one of hay, an acre of this corn will be equal to six tons of English hay. Where does a man raise that to the acre? This good English hay at ten dollars a ton would come to sixty dollars. The Secretary brought up the matter of raising fodder corn. I don't know of any other way but to take his figures although they were a little below mine. I assume that it was a fair reckoning upon that basis,—the planting of ensilage corn instead of yellow or sweet corn, as giving a larger amount of feed. It is said that the amount is not as valuable, that it takes three tons of this silo feed to be equal to one ton of good English hay. I have known the average to be, on a large number of acres, twenty-five tons of this coarse fodder corn to the acre. This was cut down to twenty,—I think it was hardly fair. Now we are sure, taking this as a basis, of twenty tons to the acre.

We will see how this compares. Twenty tons of this to the acre, three tons equal to a ton of English hay, because it is not as good fodder as yellow corn, gives us six and two-thirds. Thus, according to their figures, English hay should give us sixty-six dollars per acre and a fraction over. This fodder raised in small amounts will do well enough to dry; but if it is to be cured to a large extent, to keep cattle upon during the winter months, it must be done by some other process than in the old-fashioned way. I feel as if it were up hill business to feed cattle other than upon this beautiful grass; but I know that grass will sell in hay and bring just as good money here as in my town, or any other town. I know of farmers who raise hay to sell and raise corn to use as fodder to keep their stock upon. Where this has been done to any extent, it must be by the use of the silo and no other way.

Now the question comes up with regard to the siloing of the yellow corn in this way, instead of drying, husking, shelling and carrying to mill. It looks to be safer and better by the old fashioned way than cutting it and putting into the silo. It can be done in this way very much cheaper; it is labor saving; what is done in this way is money saved. It is thought by some that this costs too much, that hired labor costs too much.

I wish to give you the figures of a few western states that raise yellow corn. It costs them nothing and we buy of and bring it here, while there are men in Maine who will tell you,—*have* told us, that we can raise it here cheaper. The State of Maine the past year was only excelled by one state in giving the largest average of yellow corn per acre. Minnesota by the report of 1887 gives the average of twenty bushels to the acre. The next state, Dakota, gives an average of eighteen bushels per acre. Kansas on an average gives thirty-five bushels of corn to the acre. We feel that the State of Maine is not behind other states. While we know the corn crop is fed out to great advantage in our State, if we can cure it in a satisfactory manner, we can make corn growing in Maine the most profitable crop in the State.

I cut my corn for the silo usually with a machine. I use Dr. Bailey's cutter, one of the large size. The retail price was ninety-five dollars.

A. T. CLIFFORD.

Mr. Chairman and Gentlemen: Farming is a business that wants a pretty good head. I believe it is a paying business and needs more brains than to be a doctor or a minister and I haven't brains enough for either. I believe it will pay if conducted on business principles like any other business. My specialty is dairying. Of yellow corn growing I have had but very little experience; my corn crop is sweet corn. Why do I raise sweet corn? The principal reason is because I want the fodder for my cows; my object is to get something to feed my cows and make them produce more milk. I usually plant quite a piece of sweet corn. I don't say that I do it as I *should* do it; I do not do it as well as I *know*, always; but I will give my way of doing it

There is a difference in soil; Mr. Cobb has a different soil from mine. I have a fine, deep soil; the rocky land has been well cleared. My soil isn't a light, warm soil, but I do the best I can with what I have. When I plow, if I could break it up as I want to, I would break it up one day and have it freeze the next, that is what I would do if I could, if I knew enough to have it so,—but I break it as late as I can. I want it plowed thoroughly, would like to have it turned exactly bottom side up, but the rocks do not let me do that always. Then I spread my dressing on broadcast and harrow it very deep. I use, to go over it with a spring tooth harrow first, then after I get it level,—the spring tooth is a good leveler,—I want to go over it and take off every stone I can get off, then put on the disk harrow. I go both ways,—go lengthwise with the spring tooth, then the other way with the disk. I want to pulverize that as deep as the disk harrow will let me; when I do that, I have better results. Then I take a smoothing harrow and just smooth it.

Ques. Do you ever use anything except the smoothing harrow?

Ans. I have used the brush considerably and sometimes with the Dow harrow. If the ground isn't quite dry enough it will leave it a little lumpy. The smoothing harrow will also leave it so;—the brush harrow will grind it up like flour. I keep working the soil till I get it to suit me. If there is a heavy rain before I plant, I start the harrow and pulverize. I have made a marker that I use, then take the planter that I have and plant my corn. I have my rows three feet and three inches apart; I have commenced to plant now, three feet in the drill. Then I have the Thomas smoothing harrow and Breed's Universal Weeder, perhaps you have seen it, two rows of teeth and two handles to hold it. The teeth run on the end like a harrow, I should say twenty inches or two feet apart. You can drop it almost to the ground;—take that and go across among the rows before the corn is up. That will level it and if any weeds start before the corn does, that fixes them. After the corn is two or three inches high, I go lengthwise with the smoothing harrow or Universal Weeder,—the principle is exactly the same. I use it once before the corn comes up, then I use it twice afterwards. I go one way, then after a short time, I cannot tell you exactly the time,—I watch my corn,—I go the other way.

Ques. How high is the corn when you use it the last time?

Ans. Three or four inches,—then I have a light spring tooth cultivator, two of them, which I use with a span of horses. When I have a large piece I set one boy to drive two horses. My corn is in drills and I can run the cultivator, this spring tooth cultivator right along, I think within an inch. If I am in a hurry, I set two cultivators at work. Last year I hired a man to cultivate,—my son who is ten or eleven years old, usually cultivates,—this young man knew a great deal; I set him at work with the cultivator and the result was we had an abundant crop of weeds. He didn't dare to go within four inches of the corn. I cultivate my corn after a heavy shower or a rain.

Ques. You can run the cultivator within an inch fore and aft?

Ans. Yes; we go twice a row, drag that right along. I cultivate as shallow as I can, I don't wish to disturb the manure that is spread over the ground; I wish the roots to get all they can; I simply want to keep the ground loose and light and keep the weeds out. I don't know as I am right; I come down here to learn something, we all have a way.

Ques. Do you go through with a hoe before haying at all?

Ans. No, not when we do business as we intend to; this last year, I think I had too much business; I got this fellow who went through the whole. I want to kill the weeds as soon as they start. I attend to my corn; if it is haying time, I stop and attend to it; I don't want weeds, any way.

Ques. How deep do you break the ground?

Ans. I want to break it ten inches deep with my kind of soil. In plowing I always go deep enough to turn it back.

Ques. You speak of running the cultivator after rains; what is the advantage of that frequent cultivation; what is the particular necessity of it?

Ans. After a rain the ground bakes hard; now I want the soil light so the sun can penetrate; if there is moisture there it will come out and we get more air about the roots of the corn.

Ques. Would you go lengthwise instead of crosswise?

Ans. I have tried both ways and prefer the crosswise.

Ques. In preparing the soil to raise a crop where you want skilled work you wouldn't trust it to every hired man?

Ans. No; I trusted it to that fellow and he didn't do it.

Ques. Would it be profitable for a man, if he had more farming than he could do himself, to buy this machinery and employ such help as he can on a farm, and go to raising crops in that way?

Ans. I want to raise all the corn I can; the hardest question we have to solve in the matter of farming, is the hired help; but I shouldn't discontinue my farming on account of it. It is no use to go into business unless you intend to look after it; you must look after the business instead of sitting in the store and telling stories while the hired help are doing your work. I wouldn't ask any one to warrant me less than fifty dollars an acre;—usually I get fifty dollars an acre. I planted ten acres last year, I shall plant ten this year. I put what manure I have each winter on the green sod and plow it in in the fall. I don't harrow it in the fall.

Ques. Do you say you spread on the green sward and plant ten inches deep?

Ans. Yes. I don't cultivate it, it lays there till spring.

Ques. If you put on manure and there come dry winds, is there a loss in that manure?

Ans. I have thought so but I cannot say fully, but I believe from observation of land I have dressed and seeded down, that you don't get it the first year in a corn crop. I believe the fertilizing material is there and if the action of the rain and sun comes upon it, it will come.

Ques. Don't manure back and wash off quite a distance?

Ans. I don't think it will. If on a side hill, it might. I don't think you will lose any dressing.

Ques. How many cords of dressing do you put to the acre to raise this crop of corn?

Ans. Somewhere from eight to ten cords to the acre. I haul it out with two horses and an ox cart that holds about forty bushels of potatoes. I put that on twenty-five times full to the acre. I don't believe in dressing as heavily as some.

Ques. Do you use special fertilizers?

Ans. Yes. I bought two hundred and fifty pounds. I only plant corn on a piece one year, then sow to oats.

WEDNESDAY AFTERNOON.

WARREN H. VINTON.

One good cow is worth more than two or three poor ones, we ought not to keep any but good ones. The more poor ones we keep the poorer we grow. Professor Cheesman is here with his Babcock Tester; he will tell you about testing milk and show you whether you are keeping poor or good cows. The specimens of milk he has gathered right here.

PROF. JAMES CHEESMAN, Southboro, Mass.

Mr. Chairman and Gentlemen: For a good many years, manufacturers of dairy apparatus have tried to devise some scheme of testing milk and cream which would be simple enough, easy enough to be operated by the average butter maker and farmer in any part of the country. These attempts have been very numerous during the last ten years, but until Dr. Babcock, chemist of the Wisconsin Station gave us the tester which we have here, we had no method sufficiently accurate, cheap, easily operated which was likely to come into general use. The extraordinary appreciation shown for this method is sufficient testimony of its practical efficiency for all purposes; testing individual cows and herds on the farm, and milk received by milk contractors in cities, and later, thanks to Prof. Bartlett, to the cream and butter factories in this and other New England states.

This machine has been before the public eighteen months,—about that time ago, the earliest ones, of which this is an example. There have been improvements which make them easier to transport, easier to operate, in every respect simpler than this, although this is extremely simple. (The Professor explained the difference in construction between the machine he had and the improved ones.)

There is a wide difference in favor of the modern machines, they are more simple in construction, less liable to be broken. The principle of construction in these machines closely resembles each other; it is exactly the same as that followed in the construction of the milk separator which is used in this State and other parts of the country. The principle of action is centrifugal force. The machine has about eight hundred revolutions per minute. That is sufficient for the operation of six or seven minutes to bring the oil of the fat to the top of the shoulder in these small bottles. This process is partly chemical and partly mechanical.

The entire quantity of milk operated upon is an amount sufficient to be held in these little tubes, up to the point indicated on my longest finger;—seventeen and one-half centimetres or about seven-twelfths of an ounce. That quantity is run into these bottles with a similar amount of sulphuric acid by measurement.

When machines of this kind are furnished, the necessary apparatus is furnished, and if you break one of these bottles it can be replaced. After the quantity of sulphuric acid is mixed with an equal quantity of milk, in these small bottles, and whirled to ensure thorough mixture of the compound, the effect is to dissolve the caseine of the milk and break it down, everything but the fat which you wish to separate. The sugar of the milk is acted upon, charred or burned, which gives it a dark color, like when sugar is boiled to make caramels, it becomes dark. The bottles are placed in the nests, of which there are twenty in this machine; they vary from four bottle machines to sixty, commencing at $10 and running up to $50. The machine before us cost, complete, about $20. It is a very satisfactory machine. You can get one for the farm for $10.

The bottles having been placed in these nests, the machine is turned in this manner, as fast as an ordinary person can turn it, until you get eight hundred revolutions per minute. After turning seven or eight minutes, the bottles are removed, they are filled to the point below the base of the shoulder, we run in water of same temperature up to the base of the tube. Replace and turn one or two minutes and the effect is to bring the fat to the top of the bottles. That is the effect of centrifugal motion when turned at the proper speed. The bottles are then removed and a further supply of hot water is run up to the top of the neck of the tube to bring the fat into the neck, which is calibrated to two-tenths of one per cent. I can get the reading up as close as a five-hundredth per cent.

I had assumed before I left Portland that Gloucester had a drug store here, but we have telegraphed to Auburn and have the promise of the acid at two o'clock. We can finish before evening and make the announcement so each may know how much butter fat each sample will make. I have twelve samples here; they represent a wide range of qualities. I think some of them must have been imperfectly sampled; but they are from cows long removed from calving.

Owing to such weather as we have had during the last twenty-four hours these samples should have been lower than they are now.

Mr. True furnished me with ten samples. In a few minutes we will put him through a course of examination and find out what the cows were, the time of calving, what his feeding is;—we may learn more of the samples.

The first sample records three and six-tenths per cent of butter fat. That is one-tenth per cent below what is required for the Boston milk market.

Number two is a good deal better; this is four and four-tenths per cent butter fat.

Number three is extremely low, two and six-tenths per cent. Number four is four and eight-tenths, number five, five and one-tenth per cent.

You will notice the difference in the color of the fats contained in these samples. It is almost invariably the case that the difference in the color in butter fats, corresponds very closely to the difference in the quality of the butter produced.

Number six, four and nine-tenths per cent butter fat. Number seven, four and five-tenths.

Here is a sample said to be from a Jersey cow; this is a very high one, contains five and four-tenths per cent butter fat. Here is a sample from a grade Swiss that is six and four-tenths per cent and another, seven and eighth-tenths per cent of butter fat. Here is a sample higher, eight and one-tenth per cent butter fat, from a grade Hereford. I am inclined to think this is an abnormal amount of butter fat;—we do not often find milk that will read as high as that. It is extremely rare to exceed six per cent in butter fat.

Ques. May not there be more butter fat than a fair average from the milk of the cow?

Ans. Yes; I am obliged to you for speaking of that. With reference to these samples, you will observe that they are from individuals. I think the abnormal fat yields of the last three samples are due to imperfect sampling. Variations in the quantity and quality of the milk from individual cows are very wide. One of the most prolific causes, especially at this season of the year, is change of weather such as we have had during the last twenty-four hours. Cows shrink in the yield of milk when we have these sudden changes. That explains why we get such readings, getting samples from this morning's milk.

Ordinary good milk at some of your best creameries,—that is, creameries where butter is made from cream supplied from Jersey cows, or high grade Jerseys, three and nine-tenths to five and one-half or five and five-tenths of butter fat would be about the range of reading. Less from grades, much more from thoroughbreds.

In a creamery in New Hampshire where I am familiar, where nearly three thousand tests have been made, a majority of the cows are Guernsey grades. There is a wide variation in methods of feeding, of conditions as to age, period of lactation, period of gestation. The result of these two thousand one hundred tests up to five or six weeks ago gave an average of four and nineteen-hundredths per cent butter fat. The average of Maine ought to be four and one-fourth per cent butter fat for the average creamery cow.

You may be interested in a statement of the quality of milk covering a long period of several months made at Amherst Experiment Station. Several attempts had been made to reduce the legal standard fixed by Massachusetts of the quality of its milk. At a hearing of the legislative committee the following figures were submitted by Prof. Grass. I will give you the tests made on individual cows, covering a period of several months, then give you tests of a group of cows, ranged according to breeds: One cow, fifteen and forty-seven one-hundredths per cent total solids; another, fourteen and sixty-eight one-hundredths; the third, thirteen and twenty-six one-hundredths; another, thirteen and one one-hundredth. A Holstein ten and eighty-three one-hundredths; another, twelve and forty-six one-hundredths and another twelve and seven one-hundredths. A cow thirteen years old, weighing eleven hundred pounds, sixteen and thirty-six one-hundredths per cent. The average for six Ayrshires giving milk for seven months, was thirteen and twenty-two one-hundredths total solids. The average for five Holstein cows was eleven and ninety-one one-hundredths total solids and three and one-tenth per cent butter fat. Four Shorthorns, in milk for nine months averaged thirteen and nineteen one-hundredths total solids and four and four one-hundredths per cent butter fat. For three Jerseys, thirteen and ninety-one one-hundredths per cent total solids and four and ninety-six one-hundredths per cent butter fat. One Jersey, one year in milk, sixteen and thirty-six one-hundredths solids and six and seventy-nine one-hundredths butter fat. So you see in these tests, this is a thoroughbred Guernsey cow, the butter fat is only six and seventy-nine one-hundredths per cent.

Ques. Have you figures with regard to the butter found in skim milk?

Ans. I will give you some reports.

Ques. It is important whether you are creaming your milk clean or not,—whether you are getting all the cream out of the milk that you might, or ought to secure?

Ans. Here is a report of a test made at South Paris last week. The skim milk in this case was by open pan setting and left sixty-five one-hundredths per cent of butter fat. When efficient work is done with the separator, we can get within fifteen one-hundredths. With the most recent, we can get within ten one-hundredths per cent. The difference between ten one-hundredths per cent and sixty-five one-hundredths per cent, would be five and a half pounds of butter in a thousand pounds of milk. To enable you to understand more clearly what we mean,—that would represent the work of about twenty cows for a period of three days;—twenty cows of a high grade of butter quality averaging nine hundred pounds each.

Here is a report of another test, which I think was made at Kennebunk, two samples at Kennebunk. These illustrate the wide variation met with in individual practice, even where the same method is employed. I will explain to you what these variations may be caused by. The first sample is skim milk by the Cooley process and represents only five one-hundredths per cent; that would be about half a pound of butter fat in a thousand pounds of milk, as against the case I have referred to. The other sample of skim milk raised by the Cooley process by a patron of the same creamery was four-tenths per cent of butter fat,—four pounds to a thousand pounds of milk.

These differences are caused mainly by want of care on the part of the patron in setting the milk. It is important, if you wish to get the best results, to get your milk set as soon as possible after the milking is completed.

Professor Jordan is coming in later on in the discussion; he may be able to give you some of the variations in cream due to delays in setting the milk. They have been working on that subject during the last year. These variations may also be due to a large proportion of long calved cows in the herd; such milk is more difficult to cream than milk from fresh cows. I do not remember in these two cases just how long the cows were from calving.

Ques. Does it make a difference with the separator?

Ans. None whatever; the separator will take out everything without reference to that; it is forced out by centrifugal force; that is a mechanical matter. In the other case we have to depend upon the principle of gravitation and time.

Ques. Does the quality of milk, as affected by breed, have anything to do with the separation?

Ans. Yes; we had with us last week some charts prepared at the Orono Station by Professor Jordan, representing work they had done, also similar work at the New Jersey Experiment Station.

The object of that work was to illustrate the difference between breeds in yield of milk, yield of total solids, yield of cream, yield of butter fat, and the cost of milk per pound, and the cost of the butter fat. In the case of these tests, as I remember, the Holsteins weighed about an average of twelve hundred pounds; the Ayrshires something over nine hundred pounds, and the Jerseys and Guernseys eight hundred to nine hundred pounds. The Holsteins gave about five-sixth of their weight in total solids and one-fourth of their weight in butter fat. To get the quantity of butter, you would add twenty per cent to the amount of butter fat. The butter fat is a quantity determined by actual chemical analysis and comes a little shade closer than this. The Jerseys gave forty per cent of their weight in butter fat; their full weight in total solids.

It is fair to say, however, that pound for pound of milk, the Holsteins made milk at less cost; but the quality showed much lower. Pound for pound you get the milk at less cost. There was less food material in the milk, less commercial value of the milk. The Jersey milk was creamed so closely at the Maine Experiment Station, that not more than fifteen one-hundredths per cent of butter fat was found in the skim milk. There might be one or two hundredths out. The Ayrshires, whose milk closely resembles the Devon in this respect, is difficult to cream. If you set the milk in shallow pans you get a very gelatinous condition of the cream. The Ayrshire milk left forty-five one-hundredths per cent, three times as much butter fat as the Jersey. The Holstein was about ten-one-hundredths per cent loss, thirty-two, thirty-three or thirty-five one hundredths per cent butter fat. In the buttermilk, the churning of the cream was so easy, so exhaustive that not more than eighteen one-hundredths per cent of butter fat was found in the buttermilk in the cream furnished at the Experiment Station; while the Ayrshire gave about one and eight-tenths per cent of butter fat in the buttermilk, the Holstein gave one and thirty-five one-hundredths per cent butter fat.

This difference in the yields of butter fat from the whole milk and the total yield of commercial butter produced, are matters of serious consideration to those who keep cows for the production of milk or cream. Milk, testing three and one quarter per cent of butter fat, would yield about eight or eight and a half or nine per cent more commercial butter. Milk producing four per cent of butter fat would yield about eleven or twelve per cent more butter. The increased percentage and increased cost, depend largely on the water left in the butter. As a rule, creamery butter contains four or five per cent more water than well made farm butters; so the results I have given you were selected from carefully reported work in some of the best creameries in Wisconsin and Illinois.

You see, with a cow bred for special butter purposes, you not only have a much richer milk to deal with, but milk capable of creaming more exhaustively than that from cows which have not descended from animals specially bred for butter purposes.

Ques. Have you the cream tester?

Ans. No, I have not, here. Several questions have been asked with reference to the cream tester. I will deal with them now. Two of these bottles here, devised by Prof. Bartlett of the State College, can be used in this drum,—in case of separating cream, where the percentage of fat is higher than twenty-three per cent. The quality of Cooley cream as ordinarily made runs from seventeen to twenty per cent. The difference in quality depends upon the temperature of the fat and water and the length of time the milk is allowed to set. To meet the wants of those who desire to test cream of heavier quality than the Cooley, Prof. Bartlett has devised a separable tube, —the base of which is a small bottle standing as high as my left thumb (illustrated.) It is rarely you meet with cream that registers above thirty-five per cent. (Described method of separating.)

The same quantities of acid as were used in the case of milk are taken and the contents of the bottle thoroughly mixed, then placed in the machine and the same process gone through with, with this exception,—I think Professor Bartlett used very dilute acid, with acidulated water which he describes in his bulletin, (see report of experiment station in report of Board for 1890.) That is used always when they operate in a warm room and have sufficient water in the drum to keep the fat liquid. I want to call your attention to the condition of the fats on exposure to the air of this room, which is about sixty-eight degrees. The fat very quickly solidifies. It is absolutely necessary to have it at blood temperature in order to get correct readings. I might say at this point that it has been deemed wise on the part of the Board of Agriculture to go slowly with this matter; the bulletins having been distributed from the Experiment Station, and they are awakening a great deal of interest;—but the members of the Board of Agriculture do not consider it their business to disturb the condition of feeling among patrons. If you are not satisfied, we are here to answer any questions.

In adopting the test which Prof. Bartlett has devised, the application of this method for farming purposes, every farmer must be a breeder; though he may not breed thoroughbred cattle, he needs to know how he should conduct his breeding. It is a very important matter to him that he be able to test from time to time, as you may with this machine, animals about which he has suspicion. There are some animals which we know are good enough to keep for profit; there are others we are doubtful about. It requires some judgment to enable one to weed out the poorest. To deal with these animals in a satisfactory manner, this machine steps in and gives us the method of doing the work. In the western states, New York and New Jersey, farmers' daughters have been entrusted with this work. It is so simple, as you see, that, with ordinary care, any intelligent boy or girl of sixteen or seventeen can use this machine after three or four trials. At creameries at Illinois and Wisconsin, they have turned over this work to the lady book-keeper.

It is frequent to find young women in western creameries doing work of this kind.

With reference to the breeding of animals, we are not here to say whether you shall keep Guernsey or Jersey; but we are here to recommend to your notice what has been accomplished in the State of Maine by the use of special butter bred animals. I believe it is a fair assumption to say that at least sixty per cent of the cows furnishing cream to your most successful creameries, represent the blood of Jersey cattle.

If this is so and if men who have kept these animals have been able to secure from forty-eight dollars to fifty-five or sixty dollars per head for the entire herd of all ages and conditions, is it not fair to assume that it would be a most suicidal policy to use cattle because they are larger and give more milk? You are near Portland and if you are not engaged in the milk business to-day, the day is not far distant when you may be. It is not impossible that within the next three years in this territory, or some of the towns near the railroad stations, parties may be collecting milk to ship to the city of Boston. Some of the milk supplied to Boston comes from Brattleboro, Vt., transported over three roads.

If it has been found convenient to bring milk to Boston from a state where the majority of the animals are Jersey or high grade Jersey, is it unreasonable to suppose that before long, if your cows increase, Boston contractors may be found in this part of the country seeking to make up a carload of milk? If you are not satisfied to keep animals weighing from seven hundred to eight hundred pounds,—it is quite possible that by careful nursing in calfhood and proper work in winter dairying when cows come in in the fall, you may breed up your animals in the matter of size, by increasing the quantity of nitrogenous food during infancy. At several farms, the average size of the Jerseys may be set at nine hundred to one thousand pounds weight. I suppose it would be more nearly correct to set the weight of Jersey cows in Maine at eight hundred and fifty or eight hundred and sixty pounds; many are much smaller.

If you decide that this careful nursing of calves will not give you a rapid increase of size, you have the choice of Holstein-Friezen bull; but I cannot advise you what breed to use in breeding. Be very careful to learn what kind of dams they had. You can get into a pedigree of large udders, well developed, of fine qualities for butter, and it does seem to me by breeding for a moderate increase of size in the prospective cow, you will meet with the same disappointment which men in other parts of the country have met with.

I believe that by a process of careful feeding, animals may be brought to a certain point; but beyond that, except in the case of animals of especial butter quality, you cannot go. You can go on increasing the quantity of milk within reasonable limits but that depends upon the quantity and quality of the food.

In respect to the earnings of individual cows, there is no north, no south or east for successful dairying because we find the same extremes in the western states as in Maine, Connecticut or Massachusetts. Probably you can show as many patrons of the creameries in the State of Maine making an average of eighty dollars per cow as we can in Massachusetts or Connecticut creameries. These conditions depend upon the individual running the cow; on the intelligence, skill and good judgment he has shown in building up a herd for butter production. In this building up, food, as well as selection of right sires and well bred animals, is a very important factor.

The question always comes up in feeding animals to their very best or within close limits of their best,—how far it is safe to go. Here comes in the individual judgment of the farmer; this is a question which is known only to him. If we except some of the abnormal butter yields of some cows, comparing others with our own experience, we cannot doubt that there is a wide variation due entirely to skillful handling and good judgment.

This is a problem which the Board of Agriculture desires to force upon the attention of every one who comes to assist in the work. I am not here to advise those who are in the milk business or who are likely to be, to use a high grade Jersey cow for that purpose. I do not think the Jersey cow is a satisfactory animal for the milk business. Even Philadelphia, a market more fastidious than Boston, has found that a high grade Guernsey was more satisfactory than Jersey cattle. Every feature of the Jersey cow which makes her an exceptional butter animal, producing milk which is easily creamed, whose cream has a high churn-ability, unfits her for the milk business, because of the ease with which the cream separates from the milk.

All the way you can prevent this is to divide it up among all the customers with other milk. This division adds to the cost of transportation. When it is practiced on farms, distant from the point of consumption it might be attended with serious inconvenience.

When circumstances are favorable and farmers market their milk within easy distance, they are able to earn six cents a quart and not to incur an expense of more than one and one-fourth cent a quart for marketing.

The question may arise in your minds, whether now or in the near future, contractors may be found who will buy solely with thought to its quality. Some of the Boston contractors, rather than continue to contract for large quantities of milk within easy reach of the city, say fifty or sixty miles, have gone out into Brattleboro to collect partly cream and partly milk; they collect cream from the stations which have produced by the separator process, those near by, and then go farther north than Brattleboro into West Randolph where thirty thousand quarts of milk are collected some seasons of the year. Twenty per cent of this milk is paid for, or the cream is paid for, and the farmer gets the skim milk back at prices that farmers realize within fifty miles of the city of Boston.

Then all freights within a radius of thirty to fifty miles are borne by the milk producer, and the farmers between these belts of fifty or sixty miles get less money for whole milk put on board the cars, than do the farmers of Northern Vermont. The cream contained in their milk is systematically tested, a sample taken every day and preserved, and payment made at the end of the month. The report came to me that one of the patrons of this station of milk collected averaging one dollar and fifty-five cents per hundred pounds, receiving back the skim milk, which is worth three cents a quart and that he gets as much skim milk as if the milk had been set in the Cooley Creamer.

Mr. HAMMOND. The samples from the grade Swiss were taken from the first of the milking and from the last of the milking of the same cow, not mixed,—the first third and the last third of the milking.

Prof. CHEESMAN. The record reads, No. 1 grade Swiss six and four-tenths per cent butter fat. No. 2 sample taken from last third, seven eight-tenths per cent butter fat.

Mr. HAMMOND. There is one sample of grade Hereford; that was an average sample from the grade Hereford.

Prof. CHEESMAN. How long did the milk stand before taking the sample?

Mr. HAMMOND. I took it immediately. The cow gives about six quarts.

Prof. CHEESMAN. That is eight and one-tenth per cent butter fat.

Mr. HAMMOND. The grade Swiss is giving about the same quantity of milk.

Mr. GILBERT. I want to ask Mr. True if any of the samples are from his grades?

Mr. TRUE. Numbers one and three; they are two-year-old heifers. One is one-half Holstein and the other, not quite pure Jersey. No. 3, was fresh in milk, the other cow had been giving milk since June. She is seven-eighths Jersey.

Prof. CHEESMAN. Her milk is four and four-tenths per cent.

Mr. TRUE. No. 4 is a two-year-old heifer; been milked since September; she is nearly full blood Jersey.

Prof. CHEESMAN. That is four and eight-tenths.

Mr. TRUE. No. 5; she has been giving milk nearly a year; she is fifteen-sixteenths Jersey.

Prof. CHEESMAN. That shows five and one-tenth per cent butter fat.

Mr. TRUE. No. 6. She has been giving milk ten months; is nearly full-blood Jersey.

Prof. CHEESMAN. Four and nine-tenths per cent butter fat.

Mr. TRUE. No. 7. She has been giving milk since May; is full-blood Jersey.

Prof. CHEESMAN. This is four and five-tenths per cent butter fat. One test cannot be taken as indicating the true value of a cow. You cannot get a correct idea unless the tests are followed up for ten consecutive milkings, on account of variations from day to day.

Mr. HAMMOND. This Swiss cow was from one of the best Jerseys I ever owned, bred to a Swiss bull, and the Hereford is this Swiss cow's calf, bred to a Hereford bull.

Mr. VINTON. How do you feed the cows?

Mr. HAMMOND. I am giving them about a quart of meal and two quarts middlings once a day; that is all they have, except hay in the morning and straw at noon.

Mr. TRUE. I give my cows two quarts of corn and damaged beans ground together, in the proportion of two bushels of corn to one of beans; and two quarts of cotton seed, at two feeds.

Ques. What is the effect of feeding beans to a cow?

Ans. That would depend upon the composition of the entire ration.

REVIEW OF THE YEAR.

In looking over the work of the year just past, we find much matter for encouragement, the general outlook for farmers seems to be improving, and not only is the tendency of the times toward better returns for agricultural products, but the farmers, themselves, never seemed more hopeful than now. The thinking farmer who views the signs of the times aright, has much reason for a more hopeful view of the situation. New outlets are everywhere opening for the sale of the products of the farm, and the tide of western emigration and western speculation has slackened. More money is being put into circulation in our own State than ever before, in buildings for caring for, and manufacturing the products of our farms. The general manufacturing interests of the State are being rapidly developed and thereby the pulses of agriculture are quickened. How much of this upward tendency among the agricultural interests in our State is due to the efforts of the Board in the past may be a matter of opinion, but it would seem that to the efforts of the organization, could be traced very much of it, through the organized efforts of our Agricultural Societies and the labors of the Board I believe we must look for that uplifting of public opinion, that betterment of farm practices and that general upward trend of enlightenment and progress which seems to be the tendency of the times.

Several new creameries have been started the past year under very promising conditions, many of the old ones have been strengthened and are extending their business.

The attention of our farmers in several sections of the State is being turned toward condensed milk as a practical outlet for a part of the milk from their farms, and while this is a new avenue of trade for us, fraught with some uncertainties, we look upon the venture with much satisfaction, and if not engaged in too largely, and the factories are well managed, managed so as to produce a first-class product, we may expect a success. In this business, the farmers have a work to do, and it is one that cannot fail to be helpful in all their labors, because the demand must be for a first-class article, and in order to produce this, we must observe all the rules which will tend to make the output of milk of superior quality, we must have good stock to begin with and having that, we must give good feed, in comfortable, clean quarters, with good care and kind treatment. These conditions complied with will bring success, and will have a healthy effect upon all our labors by the natural reaction upon our general farm management.

The pasture problem meets us at the very start, and, I believe, can be summed up in a very few words. If we intend to pasture our tillable land it must be put in our system of rotation. If our pastures are permanent, they may be kept in good condition by returning some of the plant food taken off by the animals, by sowing broadcast bone meal, ashes, or other fertilizers as our circumstances may dictate. Let us either do this, keeping up the fertility as fully as possible, or if they seem better adapted to growing some useful timber, let nature work, and abandon them for more available land, not forgetting to depend, more or less, upon forage crops or ensilage to supplement and increase their capacity. We look for a rapid increase in the system of partial soiling for stock, as our dairy interests are further developed.

The year just past has been the first one under our larger appropriation. Farmers have responded well to the calls for increased Institutes, and as far as I can judge they have been generally successful. What we need is a more general diffusion of the subject matter treated at these meetings by a more liberal use of the press, in order to penetrate the homes and reach the farms of those who by force of circumstances cannot attend the meetings.

There were three Institutes held in June, but the year reported in this volume really covers the time from October 21, 1891, to the last of February, 1892.

The Institutes held are as follows:

Hancock county, at Orland and Sedgwick.

Kennebec county, at Oakland in June.

Beginning fall work at Princeton, October 21; Pembroke, October 23; Monson, October 28; South Dover, October 29; Exeter Mills, October 29; Albion, October 30; South Hope, November 3; North Warren, November 4; Round Pond, November 5; Damariscotta Mills, November 6; Phillips, November 10; Farmington Falls, November 11; Dairy School at Orono, November 13 and 14; Greene Ridge, December 2; Easton, December 3; Monroe, December 8; Buxton, December 11; Alewife, December 12; Rumford, December 22; South Paris, December 23; Harrison, December 29; New Gloucester, December 31; Sherman Mills, December 31; Litchfield, cancelled; Livermore Falls, January 7, 1892; Dairy Conference at Auburn. Joint meeting of State Pomological Society and State Board of Agriculture, at Cornish, February 17th and 18th.

Institute at Augusta, February 23d.

The total cost of these meetings, or of the year's work is $3,867.86, an excess of the appropriation for the year of $867.86, which must come out of the appropriation for 1892, making the sum available for the work of the year only $2,132.14. The average cost of the Institutes, not including the expenses of the Secretary, is $128.92.

In closing this chapter I should say, in justice to myself, that as there were no records of the work of the Board left in the office when I begun my work, it has been very hard to get at anything like a full review. This explanation, will explain, in a measure, the fragmentary nature of the review of the year. The papers, herewith submitted, I believe are of especial value, and I trust may be freely read by every one into whose hands these reports may fall.

B. WALKER McKEEN, *Secretary.*

A FULL ABSTRACT

OF

CATTLE COMMISSIONERS' REPORT, 1891.

To His Excellency, the Governor of Maine:

We present our annual report for the year closing December 31, 1891, rather later than usual, the delay being caused by our action in quarantining our State against Massachusetts, which action was only taken after careful consideration of its effect upon the cattle traffic and breeding interests of Maine, as well as those of neighboring states.

A summary of the whole number of cases reported to the Commission in 1891 will be found to be one hundred and seventeen. Sixty-five herds of cattle were inspected and fifty-two stables, which is quite a large increase over previous years. Thirty-one head of cattle were condemned and destroyed, at an appraisal of $1,109.50, and eighteen horses were also condemned and destroyed at an appraisal of $1,480.00, the total amount of appraisals amounting to $2,589.50. The number of cattle destroyed has increased from last season over double in number, the large increase being principally due to our importations from Massachusetts, a commonwealth where, it is safe to say, a much larger percentage of her bovine population are affected with tuberculosis, than any other New England state.

The number of horses destroyed is the same as the year before, although but two of these prove to have been bred in Maine, we being indebted to Massachusetts for five, to Canada for eight, while three came from the Western States. Owing to the excess in amount of appraisals over previous years, the expenditures will considerably over-run the annual appropriation of $2,500, and we again take occasion to say that this amount is likely to prove insufficient for the future, if the work is to be judiciously and systematically carried on, and the contagious diseases of our State kept within the highly satisfactory limits of the past few years. The work and reports of our Commission prove that we have these diseases under as perfect control, as it will ever be possible to accomplish, and it will only be necessary to exercise the same watchful care in the future as in the past, to secure equally satisfactory results. The state of New Hampshire, who have also recently quarantined against the Bay State, makes an annual appropriation of $10,000 to carry on the work of their commission; and while they have been heretofore a good deal more exposed to disease by their more extensive traffic and pasturing and wintering of Massachusetts cattle, their annual report shows that their work was all confined to five counties, not nearly so widely apart or of such "magnificent distances" as our work in Maine requires.

The only cases of the year that have caused any unusual action upon the part of our board, and which have since been extensively commented upon in the New England States, are those which resulted in the notice of quarantine against Massachusetts, which is here published.

NOTICE OF QUARANTINE.

TO WHOM IT MAY CONCERN.

Public notice is hereby given, that in consequence of the prevalence of tuberculosis among Massachusetts cattle, as disclosed by the official reports of their authorities, supplemented by post mortems held in Maine of cattle purchased in that state for dairying and breeding purposes, the Cattle Commissioners of the State of Maine believe that the public health of its citizens and the welfare of this commonwealth demand that a rigid quarantine (against all cows whether in milk or dry, and all bulls for breeding purposes) be maintained on and after January 1, 1892, until further notice, and all such cattle entering the State of Maine thereafter will be subject to quarantine at the owner's expense; provided, however, that the above regulations shall not apply to Western cattle coming through Massachusetts into Maine for the purpose of slaughter.

The attention of all persons is directed to sections 2, 3, 4, 5 and 7, of chapter 138, of the Public Laws of Maine, 1887, applying to cattle affected with contagious diseases, and which will hereafter be rigidly enforced.

[Signed] THOMAS DAGGETT, *President.*
F. O. BEAL, *Treasurer.*
GEORGE H. BAILEY, *D. V. S.*

A quarantine station will be provided, near Morrill's Corner, Deering, where all cattle brought into Maine in violation of the above notice will be kept until discharged, at the expense of the owner or owners; and particular attention is called to the full reprint of the law relating to contagious diseases (see appendix) which will be rigidly enforced after this date.

PORTLAND, January 1, 1892.

The first case inspected in 1891 was on January 7th, that of a Holstein bull, King Ruiter, that had been purchased of W. A. Russell of North Andover, Mass., by C. A. Winslow of Falmouth. The bull was found badly diseased and destroyed. Appraisal $40.

Afterwards, two yearling bulls got by King Ruiter were condemned and appraised at $40.

January 12th. Inspected the stables of Bearce and Clifford of Lewiston, and found a bad case of glanders and farcy in a Canadian horse. Horse condemned and destroyed. Appraisal $100.

January 15th. Inspected the herd of Gilbert Underwood of Fayette, but no contagious disease was discovered in his herd.

January 20th. Inspected the stables of Wm. L. Davis of Lewiston, and discovered a case of glanders in a bay mare. Appraisal $50.

January 21st. Inspected stables of Fletcher White at Richmond, but found nothing contagious.

January 22d. Inspected a reported case of glanders in a mare at Georgetown, the property of W. Henry Webber, and found a bad case of chronic catarrh.

January 24th. Inspected two cases of supposed glanders at Bucksport and North Penobscot, and found catarrh in both cases.

January 29th. Inspected stables of F. P. Fox of Cornish, but found no contagious disease.

February 7th. Inspected case of reported farcy at South Paris, at stables of F. L. Starbird, but no contagious disease was discovered.

February 16th. Inspected stables of H. L. Holway of Skowhegan, and found a bad case of chronic glanders, which had been purchased in Boston, Mass., within a year. No appraisal.

February 17th. Inspected the cattle of D. H. Witham of Atkinson, and found a case of tuberculosis in a grade cow. Appraisal $27.

February 18th. Inspected the cattle of J. E. Harriman of Bangor, but found no contagious cases.

February 19th. Found a bad case of tuberculosis in a "Herd book" Jersey cow upon the premises of E. W. Hazard of Bangor. The cow was destroyed. Appraisal $90.

February 21st. Inspected the stables of C. H. Jordan at Bath, but found no contagious disease.

February 24th. Inspected the stables of Sumner Dyer, Cape Elizabeth, and found a Canadian horse badly affected with glanders. He was destroyed and appraised at $100.

February 25th. Inspected the cattle of Rodney Whittum at Lewiston, but found nothing contagious about his premises.

February 28th. Inspected the cattle of Charles Woodbury of Lincoln Center, and found a two-year-old grade bull and a calf affected with tuberculosis. They were destroyed and appraised at $26.

March 14th. Inspected stables of John R. Norton of Bath, and found a mare badly affected with glanders. Appraisal $100.

March 16th. Inspected the cattle of George H. Berry of Topsham. No case was discovered.

March 17th. Inspected stables of C. A. Chase of Fairfield, and found case of chronic catarrh.

March 18th. Inspected stables of Wm. E. Prince of "Lisbon Falls," but found no case.

March 21st. Inspected the cattle of F. N. Marston at Etna, but found nothing contagious.

March 23rd. Inspected the stables of C. H. McGillicuddy of Lewiston, and found a bay horse affected with glanders. Destroyed and appraised $70.

March 26th. Inspected the herd of Orestes Pierce of East Baldwin, but found no contagious disease.

March 27th. Inspected the cattle of Frank H. Marston, East North Yarmouth, and found no contagious disease.

April 1st. Inspected the stables of C. F. Clement of Hallowell, and found case of chronic catarrh.

April 2d. Inspected horse belonging to Wm. Wyman, East Orrington, case of catarrh.

April 3rd. Inspected stables of New England Ship Building Company at Bath, and found a bad case of chronic catarrh.

April 8th. Inspected stables of Nathan S. Collins at Farmington, but found nothing contagious.

April 9th. Inspected the cattle of Orman Wilber of Phillips, but found no contagious disease.

April 11th. Inspected the herds of E. E. Richardson of West Paris, and Franklin Shinlow of South Woodstock, and several cases of emphysema were discovered in their herds. No appraisal.

April 13th. Inspected the stables of John Nutter of Alfred, but found no contagious disease.

April 15th. Inspected the cattle of Sanford Conant of Buckfield, but found no contagion.

April 21st. Inspected the cattle of C. S. Gilbert of Lewiston, but found no contagious disease.

May 5th. Inspected horse belonging to a Mr. Johnson of Bluehill, and found a case of chronic catarrh.

May 6th. Inspected the cattle of C. F. Hilton of South Freeport, and found case of emphysema.

May 8th. Inspected the cattle of John Sweet of Atkinson, found case ef emphysema.

May 12th. Inspected the stables of Lewiston and Auburn Horse Railroad Company, and found a bad case of glanders in a Canadian horse. He was condemned and appraised at $100.

May 13th. Inspected the cattle of F. O. Hamlin of Waterville, and found nothing but emphysema.

May 18th. Inspected the cattle of Gustavus Page of St. Albans, but found no contagious disease.

May 28th. Inspected the herd of cattle of A. H. Barton of Benton Falls, and found a case of tuberculosis in a grade Jersey cow. Appraisal $40.

May 30th Inspected the cattle of A. F. Smith of Deering, and found a case of emphysema.

June 4th. Inspected the stable of D. Jordan, South Auburn, and found case of catarrh.

June 5th. Inspected the cattle of F. S. Getchell of Foxcroft, but found no contagious disease.

June 6th. Inspected the stables of Elijah and Thomas W. Young of Biddeford, and found two Canadian horses badly affected with glanders, condemned and appraised at $200.

June 8th. Inspected the cattle of Sumner W. Lane of Ripley, and found a cow badly affected with tuberculosis. Appraisal $25.

June 9th. Inspected the stables of H. W. White of Auburn, and found case of catarrh.

June 11th. Inspected the cattle of W. S Rogers of Topsham, and found a grade Jersey cow affected with tuberculosis. Appraisal $35.

June 12th. Inspected the herd of S. H. Purington of North Jay, and found a grade cow badly affected with tuberculosis. Appraisal $35.

June 13th. Inspected the cattle of Rodney Crosby of Fairfield, and found a case of tuberculosis in a grade Jersey cow. Condemned and appraised $40.

June 15th. Inspected the stables of H. M. & B. Hall of Ellsworth, and found a case of chronic catarrh.

June 16th. Inspected the cattle of C. C. Allen of Lincoln Center, but found no contagious disease.

June 19th. Inspected the stables of W. Carville of Biddeford, and found a case of purpura.

June 22d. Inspected the cattle of A. H. Nickerson of Corinth, and found a bad case of tuberculosis in a big ox. He was condemned and appraised at $65.

June 23d. Inspected the cattle of Wm. S. Rogers of Topsham, and condemned a grade Jersey cow. Appraisal $40.

June 24th. Inspected the cattle of Alonzo Conant of Lewiston, but found no case.

June 25th. Inspected the cattle of F. B. Dolloff of Mount Vernon and H. B. Whipple of Bingham, but found no case of contagious disease.

June 26th. Inspected the stock on the town farm of St. Albans, but no contagious disease was discovered.

June 29th. Inspected the cattle of George W. Reed of Orrington, and found a case of tuberculosis in a grade Durham ox. Appraisal $60.

June 29th. Inspected the stables of H. B. Watson of Freeport, and found case of catarrh.

June 30th Inspected the cattle of C. H. Bartlett of Sidney, and found a case of tuberculosis in a cow. Appraisal $20.

July 8th. Inspected the stables of Arthur McGuire at Sebec, but found no contagious disease.

July 9th. Inspected the cattle of Dr. Leonard H. Maxim of Hartford, and found a grade Jersey cow affected with tuberculosis. Appraisal $30.

July 11th. Inspected the stable of W. G. Barker of Machias, and found a case of catarrh.

July 16th Inspected the cattle of Howard E. Moulton of South Sanford, and found a case of emphysema.

July 17th. Inspected the cattle of A. W. Gilman of Foxcroft, but found no contagious disease.

July 18th. Inspected the stables of Harris W. Anderson at Princeton, but found no contagious disease among his horses.

July 22d. Inspected the cattle of E. Merither of Searsmont, but nothing contagious was found.

July 24th. Inspected the cattle of E. G. Bailey of Cambridge, and found a cow affected with tuberculosis. Appraisal $30.

July 30th. Inspected the stables of Irving S. Leighton of Cape Elizabeth, and found a mare badly affected with glanders. Condemned and appraised at $50.

This mare was purchased in Boston, in answer to one of those "bunco steerer" advertisements in the "Boston Herald," of which I will give particulars further on.

August 4th. Inspected the stables of Chas. O. Emmons of Kennebunkport, and found a bad case of glanders in a Western horse. Appraisal $100.

August 13th. Inspected the cattle of Wellington Chase of Monroe, and found a case of tuberculosis in a cow. Appraisal $30.

August 18th. Inspected the stable of Alfred H. Watson of South Limington, but found no contagious disease.

August 19th. Inspected the stables of Roland Pollard of Milo, but found no case.

August 20th. Inspected the cattle of C. S. Hayes of Oxford, but no disease was found among his herd.

August 25th. Inspected the cattle of Albert Allen and Son of Wellington, and found a bad case of tuberculosis in an ox. Condemned and appraised at $60.

September 12th. Inspected the stables of Bearce, Wilson & Co., Auburn, and discovered an advanced case of farcy in a Canadian horse. Condemned and appraised at $100.

September 15th. Inspected the herd of A. A. Young of Auburn, but found no contagious disease.

September 19th. Inspected the cattle of F. H. Towne of Kennebunk, and found a case of tuberculosis in a grade Jersey cow. Appraisal $40.

September 21st. Inspected the cattle of C. S. Hamlin and found a case of tuberculosis in a grade Jersey heifer. Appraisal $35.

September 22d. Inspected the stables of Wm. H. Smart of Bath, and found a case of glanders in a bay mare. Appraisal $80.

September 27th. Inspected the stables of Leonard Mason of Saccarappa, and found a case of glanders in a black mare. Appraisal $45.

October 1st. Inspected the stables of J. Farrington of North Leeds, but found no case.

October 3rd. Inspected the stables of Otis Twiggs of Bangor, but found no case of contagion.

October 6th. Inspected the cattle of Chas. Shaw of Dexter, but found no contagious disease.

October 7th. Inspected the cattle of Z. A. Dyer of New Sharon, but found no contagious disease.

October 15th. Inspected the stables of J. E. Kilbreth of North Turner, and A. S. Mitchell of Turner Village, but found no case of glanders.

October 22d. Inspected the stables of Nahum Adams of North Kennebunkport, but found no case.

October 23rd. Inspected the cattle of Sylvester Stewart of Litchfield Corner, and found a case of emphysema in an ox.

October 26th. Inspected the cattle of Wm. W. Cannon of West Farmingdale, and found a case of tuberculosis in a grade Jersey. Condemned and appraised $30.

October 28th. Inspected the premises of Hazen Hill of Manchester, but found no contagious disease.

October 31st. Inspected the herd of E M. Harris of Belfast, but found no disease among his cattle.

November 2d. Inspected the stable of Issachar Weymouth of Saco, and found a case of chronic catarrh.

November 4th. Inspected the cattle of Albion Carsley of Harrison, but found no contagious disease.

November 6th. Inspected the stables of Daniel Stevens of Turner Center, but found only a case of chronic catarrh in an old horse.

November 9th. Inspected the cattle of Fairfield Locke of Saco, and found a case of tuberculosis in an old Jersey cow. Appraisal $22.

November 12th. Inspected the stables of W. Grinnell of Camden, but found no contagious disease.

November 17th. Inspected the cattle of J. E. Smith, Palmyra, and found a yoke of oxen both affected with tuberculosis. They were condemned and appraised at $112.50

November 19th. Inspected the stables of Isaac N. Thompson of Greene and found a bad case of chronic catarrh.

November 20th. Inspected the stables of James S. Jordan of

Auburn, and found a bad case of glanders and farcy. Appraisal $70.

November 21st. Inspected the cattle of E. J. Pulsifer of South Auburn, but found no contagious disease.

November 23d. Inspected the cattle of Mr. Bemis of Hermon, but found no contagious disease.

November 24th. Inspected the stables of the Lewiston Bleachery Company of Lewiston, but no contagious disease was discovered.

November 25th. Inspected the stables of Edward S. Nichols of Lewiston, and found a case of glanders. Appraisal $40.

November 26th. Inspected the cattle of L. A. Genthner of Dover, and found only a case of emphysema.

November 30th. Inspected the stables of A. H. McKenney of Lewiston, and found a case of glanders in a Western horse. Condemned and appraised at $100.

December 4th. Inspected the stables of Charles H. Hibberd at Thorn's Corner, and found a bad case of glanders and farcy in a brood mare. Appraisal $100.

December 8th. Inspected the stables of D. H. Pooler of Palmyra, but discovered nothing but mange in a bay mare

December 10th. Inspected the cattle of F. O. Kneeland of Lincoln, and found a case of tuberculosis in a grade cow. Condemned and appraised $30.

December 11th. Inspected the herd of cattle of Horace Jordan of Lisbon, and found two cows recently purchased from a carload coming from Brighton, Mass., bad cases of tuberculosis. Appraisal $35 and $22.

December 18. Inspected the cattle of John P. Smith of Carmel, and found a case of tuberculosis in a grade Jersey cow. Condemned and appraised $20.

December 22d. Inspected the cattle of Nathan Bucknam of Lisbon, and found a bad case of tuberculosis, just purchased by him from a carload of Massachusetts cows. Appraisal $12.

Early in December, our board received notice that a cheap class of cattle were being brought into Maine from Brighton, Mass., and either sold for beef to low-priced consumers or disposed of to farmers in Eastern Maine. Our first notice was received from Lisbon, and on December 11th, Dr. Bailey visited the farm of Horace Jordan, and found two cows badly diseased with tuberculosis. These cows were a part of a carload of twenty-three brought here by Fred & Wm. Crowley of Lisbon, twelve of which had been slaughtered and the beef sold in Lewiston and Auburn before we knew they were in the State, and the other eleven were found upon eight different farms, where they had been sold or traded for other cattle. Another of the lot was found to be badly diseased upon the farm of Nathan Bucknam, who had bought the animal for $12.

Following these cases notice was received that similar carloads had recently been brought into Maine and shipped to different points, at Burnham Junction, Clinton, Unity, North Jay, and Oxford county, and our board followed up the several lots only to find they had recently been sold for cheap beef about Waterville and vicinity, or sold on foot and lost track of, although what few were identified were very suspicious cases, if not actually diseased. Prompt action upon our part resulted, and further importations were forbidden to take effect from January 1, 1892, and with what facts and information, upon investigation, have since been disclosed, our board relies for the fullest justification, and legality of our acts.

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Upon January first, our board also received the official report of the Board of Cattle Commissioners of New Hampshire, which is hereby given in full.

THE STATE OF NEW HAMPSHIRE.

OFFICE OF BOARD OF CATTLE COMMISSIONERS.

CONCORD, January 1, 1892.

To His Excellency, Hiram A. Tuttle, Governor of New Hampshire, and the Honorable Council:

In accordance with an act passed by the Legislature of 1891, creating a State Board of Cattle Commissioners, "for the purpose of exterminating contagious and infectious diseases, especially tuberculosis, among cattle," action has been taken and, as required by law, we submit the following brief report:

The law became operative April 15, 1891, and work was commenced at once, the efforts of the Board being mainly directed to eradicating tuberculosis from the State. The action taken has apparently been sustained by a strong public sentiment, and the owners of animals have generally been willing to co-operate with the Board for the extermination of the disease. The generally accepted belief of the highest medical authorities that the use of milk and meat from tuberculous animals transmits the disease to the human family resulting in consumption, leaves no cause for doubting the importance of the work and renders it not simply a matter of protection to healthy animals from the disease, but far more important in its relation to public health.

All cases coming to the attention of the Board have been considered and if the symptoms reported indicated the existence of the disease an examination was made.

The action taken has resulted in the condemning and killing of 111 animals infected with tuberculosis located by counties as follows: Belknap county, 3; Rockingham, 7; Strafford, 8; Merrimack, 12; Hillsborough, 81; total 111 animals.

By the provisions of the law these cattle were appraised at what their value would be if in a healthy condition, and the owner received of the State one-half the amount of said appraisal. The 111 head of cattle were appraised at $3.253 and the owners have received of the State $1,626 30 or an average of $14 65 per head.

The extent to which the disease has been found in Hillsborough county caused the board to investigate the origin and history of certain cases and in several instances it was traced directly to herds of cattle brought from Massachusetts, either for pasturage or to be sold, sometimes by unscrupulous dealers, to farmers and milk-men of our State. Cases outside Hillsborough county have been traced to the same source. In 1887, when the existence of a case of pleuro-pneumonia was reported in Massachusetts, the State Board of Cattle Commissioners of New Hampshire issued quarantine orders against all cattle from the former State, and cattle were only admitted on permits issued by the Board on presentation of satisfactory evidence by the owners that such cattle had not been exposed to pleuro-pneumonia The wisdom of the Board in taking such action was unquestioned, and all possible danger to our live stock interests was averted. Reference to the records of that time show that of the 7,000 cattle admitted under those regulations, over 50 per cent came to Hillsborough county, and doubtless the same percentage of cattle annually brought into the State since 1887 has been landed in the same locality. In this county 70 per cent of the tuberculosis in the State has been found.

These facts have convinced the Board that if any permanent eradication of the disease is effected, regulations must be enforced against the introduction of tuberculous cattle from outside the State, and such action will doubtless be taken at an early day. The comparatively limited area of our State in which the disease exists has also convinced the Board that, with proper action, tuberculosis among our domestic animals, if not completely eradicated, may be greatly suppressed and the danger therefrom to public health reduced to a minimum.

Respectfully submitted,

IRVING A. WATSON,
N. J. BACHELDER,
Cattle Commissioners.

Only to be followed by their Independent Notice of Quarantine of January 11th, as follows:

THE STATE OF NEW HAMPSHIRE.

OFFICE OF THE BOARD OF CATTLE COMMISSIONERS.

CONCORD, N. H., January 11, 1892.

To Boards of Selectmen:

You are hereby notified by the Board of Cattle Commissioners of the State of New Hampshire that a cattle quarantine against the State of Massachusetts is this day ordered. You are directed to seize and hold in quarantine all cattle not intended for immediate slaughter, coming into this State from Massachusetts after this date and to notify this Board at once of such action

Cattle from Massachusetts intended for immediate slaughter will be subject to quarantine regulations if any contagious or infectious disease is found among them; otherwise they will be allowed to proceed to their destination. All other cattle brought into the State without a permit from this Board must be held by you, as above directed, until this order is cancelled.

Any violation of this order coming to our knowledge will be prosecuted in accordance with the provisions of the General Laws of New Hampshire.

IRVING A. WATSON,
N. J. BACHELDER,
Cattle Commissioners.

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We offer the text of the Massachusetts Commissioners' Report for 1891, for the better understanding of all concerned, and also to give to our colleagues the benefit of a full hearing in our State.

REPORT OF MASSACHUSETTS CATTLE COMMISSIONERS' ON BOVINE TUBERCULOSIS, 1891.

Though certain forms of lung trouble among our cattle had been previously reported upon by our Board, the first specific report on this disease was made in 1880, and it has been discussed, and information respecting it given, in each of our reports since 1886. It has been our earnest endeavor, each year, to make a complete survey of the entire field and all the stock committed to our oversight; to report the exact facts obtained by our observations in relation to the extent to which the disease prevails, and the danger therefrom to our people by the consumption of our stock products; and to do this without any regard to alarmists who, on the one hand, are apparently endeavoring to make business and money for themselves by circulating sensational reports; or, on the other, to those who declare there is no such disease or danger, that they may be unchecked in the sale of milk or meat, however infected it may be. In our last report we discussed this whole matter at considerable length, and quoted from an article on "The present attitude of veterinarians on the subject of tuberculosis," by Dr. Daniel D. Lee, instructor of anatomy in the veterinary department of Harvard University. In this article he quotes the opinion of Professor Airlong, an authority on this subject, "that tuberculous milk and meat is the least important source of this contagion," and that "only about five in a thousand is the number of tuberculous cattle found." He says, "The chief source of danger, both in animals and men, lies in the inhalation of dust containing the dried sputa, in those localities where the population is dense and the disease prevalent." And again he says, "I enter a plea that the severity of the crusade against our cattle be somewhat lessened, until some steps are taken by the medical profession and boards of health to quarantine human beings suffering from tuberculosis." He closes his article as follows:—

"I wish it understood that I believe tuberculosis to be a very contagious disease, but slow in it course. Every one will acknowledge that the danger from the milk and meat is the *very least*. The milk is diluted by that of healthy cows, under which circumstances even direct inoculation often fails; and the meat is only diseased in five cases in one thousand, and then is generally cooked. The danger from inhalation of dried sputa in the dust is very great either from man to man, or man to animals. Therefore, let us wait a little before we condemn all the cattle and other diseased animals; for, even if we eradicate the disease among them themselves, they will contract it again from man."

Our experiences and investigations during the last year have only served to strengthen and confirm the opinions expressed in our last annual report, as well as those of Dr. Lee, here given. In an essay read by Dr. Chapin of the city of Springfield before a convention of the boards of health of the State, last October, giving an account of his investigations on tuberculosis in that city, and extending over a period of twenty-five years, he gives an opinion based on those investigations, that there was much more danger that our cattle would contract the disease from man than that man would contract it from them. In consequence of unfavorable surmises respecting the condition of the herds of cows which supplied the city of Worcester with milk, the Board visited that locality last March, and examined twenty-five herds, containing 850 cows. With perhaps one exception, the sanitary condition, surroundings and food of these herds was of the best, and the animals were apparently in perfect health. We found but one animal which had fallen under suspicion of disease; but a careful examination of it by auscultation, percussion and taking of temperature, did not disclose it. She was in prime good condition, and we learn was killed for beef about two months afterwards, and no fault was detected in the carcass. The owners of these herds did, and had occasion to, pride themselves on the condition of their animals, and the consumers of their milk may have perfect confidence in its excellence. During the year a record has been kept of 200 cows slaughtered for beef in the vicinity of Marlborough, and but two per cent were found unfit for human food in consequence of diseases of all kinds. Similar cases to the above have fallen under our observation in different parts of the State. But tuberculosis does exist here among our cattle, though not to such an extent as to cause serious alarm or justify their indiscriminate slaughter, or our total abstinence from the consumption of their milk and meat.

As a measure of precaution, and to keep it in abeyance, we recommend the continuance of the rules and regulations published in our last report. In order to secure the inspection of animals intended for slaughter, and of all provisions offered for sale, we recommended in that report that all our towns by vote at their last annual meetings accept of the provisions of chapter 58 of the Public Statutes, which would give their selectmen power to appoint such inspectors. The recommendation was not heeded; we now therefore recommend to the Legislature the passage of an act similar to the last clause of section 13 of our contagious disease law relating to glanders. This would give the commissioners power to forbid the sale of tuberculous cattle to cause their destruction, and to prevent the sale of milk and meat containing the germs of the disease.

We might here close our report on this part of our duty but for the fact that a very serious if not invidious attack has recently been made upon Massachusetts by the Cattle Commissioners of the State of Maine. By a report from that State, published in the *Boston Herald* of the 23d ult., it appears that that board, empowered, as they suppose, by a law of their State, have declared it "a crime to do business in Massachusetts cattle," and that "the importation of a single cow, no matter what breed from Massachusetts is absolutely forbidden." That Board, it appears, was led to take this action from the statements of one George H. Bailey, their veterinarian, which were as follows: "That the Crowley Brothers of Lisbon, that State. had recently imported there several carloads of cheap cattle from Brighton, Mass., which he had caused to be killed and found them badly infected with tuberculosis." He further says, "Massachusetts does not attempt to stamp out this disease, and the condition of affairs in that State is simply shocking; that that State is fairly honeycombed with diseased cattle." It should be noticed that Dr. Bailey does not claim that he has made any personal examination of the home cattle of our State, but only of cheap cattle brought from Brighton." He does, however, quote Dr. J. F. Winchester of Lawrence, Mass., who has already been alluded to in this report, and whose statements should be carefully dissected and compared before full credence is given them This is not the first time that this Dr. Bailey has made the most sweeping charges against the entire cattle stock of this State, and drawn his proof of them from the same source as now, viz., "cheap cattle from Brighton, and Dr. Winchester of Lawrence."

It ought to be sufficient for us to say that the charges against Massachusetts cattle by Dr. Bailey are untrue, and to refer to facts already given in this report as proof. But it is perhaps better that we shall allude to the legal attitude of the Cattle Commissioners of Maine, and quote from the latest reports at hand of the inspection of Massachusetts cattle and their products on a large scale to sustain them. The law of Maine above alluded to, and of which the Cattle Commissioners or Dr. Bailey are presumably the authors, is no law at all, and it is not a "crime" to import cattle from Massachusetts or any other State into Maine. Massachusetts and nearly all States westward to Kansas once committed that folly, and in 1875 passed similar acts to prevent the introduction to their states from Texas of cattle infected with Spanish fever. In the State of Missouri this law was contested, and a case brought before the United States Court, where the law was declared unconstitutional, because it attempted to interdict or control commerce between the States, which was a power conferred by the Constitution only upon Congress. Massachusetts and other States then passed enactments substituting quarantine of suspected animals when found within the State. If Maine and Dr. Bailey are still in the Union, they must be amenable to its constitution, and be careful about arrogating to themselves the powers of Congress, especially in going so far as to declare what shall be "a crime, with a penalty attached." Dr. Bailey may possibly be familiar with the cattle and the cattle trade of Maine, removed as it is from the great lines of trade and transportation of these animals; but he exhibits a gross ignorance in this regard of the conditions which do and must exist in Massachusetts.

Brighton and Watertown in this State, to which Maine exports, and from which she imports "cheap cattle" are two of the great collecting and distributing points of cattle for the whole country. Hundreds of thousands of animals are gathered here from all the New England, northern and western states and Canada, and either slaughtered here or taken abroad to other countries and states, including Maine. While here, these animals are only in transit for their real destination, or waiting for slaughter; and while here they very rarely affiliate with or become a part of our home stock. Tuberculosis exists both in men and bovines over the entire country from which these animals are gathered, and it would be very strange if an animal thus affected was not occasionally found among them, or if the Crowleys of Maine, in buying "cheap cattle at Brighton" did not get some of them. Maine is a large contributor weekly to the stock market of Brighton, and she has tuberculosis among her home stock; and it would not be strange if she contributed her mite to increase the volume of this pest of "cheap cattle" said to be found there. The facts gathered weekly show that Maine is a larger contributor to that market than Massachusetts. For the week ending December 24 last, there were in that market 2,143 cattle. It being Christmas week the number of cattle from abroad was very small; but, of the whole number stated, Massachusetts furnished 39 and Maine 104. The size of this market varies somewhat from week to week, but the comparison between the two remains practically the same through the year.

With the above facts and conditions in mind, it is well to consider the unreasonableness if not falsity of the charge of Dr. Bailey, "that, while Maine some ten years ago awoke to the realization of the danger to humanity from this dread disease, and has since actively tried to stamp it out and has practically succeeded, Massachusetts does not attempt to stamp it out, and does not spend a single dollar to accomplish so desirable an end." The people of Massachusetts and its Cattle Commissioners are perfectly familiar with the process and cost of "stamping out" cattle disease, and the Cattle Commissioners of Maine might be grateful to them for the lesson we have taught them in this regard, and thankful that, from their comparative isolation and distance from the great lines of cattle transit and market, it may be possible for them to accomplish something by the process, though infection will infallibly reappear in consequence of the existence of the disease among her human population.

With existing conditions in Massachusetts, which it does not appear to be within the range of human possibilities to change, to stamp out this disease, as recommended by Dr. Bailey, would be for us to kill and pay for all the cattle of the northern and western states and of Canada which come to our market for sale and distribution, as well as our home stock. This cannot be done, and would not eradicate the disease if it could, because, as in Maine, contamination of the cattle would follow from the presence of the disease in our human population. For these reasons our Board has believed our wisest as well as really our only course to combat this disease was by elimination in accordance with the rules and regulations published in our last report, and by preventing the sale of milk and meat which might possibly be infected. But does tuberculosis prevail in Massachusetts, taking into account both its home stock and that which is brought here for slaughter and is in transit, to such an alarming extent as is represented by Dr. Bailey? To again give an answer in the negative, we here introduce the testimony of the inspectors to which allusion has been made. Dr. Bryden of Boston, the inspector of live cattle and dead meats exported from Boston by the British steamships, makes the following report on his own work and that of Dr. Alexander Burr, inspector of dead meat for the Board of Health of the city of Boston, and which was published in the "American Cultivator" of January 3, 1891. After alluding to the reported condition of market stock in this country and Europe, he says:—

My contention is that about five per cent of the cows in the neighborhood of our large cities, with two per cent of cows, calves, oxen and other cattle in country districts, is sufficiently sensational and alarming, and an estimate that will more than cover the cases of tuberculosis among the cattle population of Massachusetts, excepting perhaps among the old cows that die in the neighborhood of our large cities; while, with reference to the cattle population of the United States, not one per cent are tuberculous. This conclusion is arrived at by me from the following data and experiences.

I have been in general veterinary practice in Boston for twenty years, and, in connection with this, live-stock and dressed-beef inspector at Boston for several of the largest British steamship lines that come to this country for the last ten years. I have yearly inspected from 25,000 to 75,000 head of cattle up to last year, and over 100,000 head this year (1890), and within six months 3,000 quarters per week of dressed beef in addition.

This embraces cattle from Canada and the northwestern states, cattle from the eastern and middle states, the South and the West; cattle of all ages, steers, bulls, cows, stags, oxen, heifers and calves; distillery-fed, slop-fed, corn-fed and grass-fed; many of them as high and fine-bred animals as there can be found in all the world. If the disease is present to the extent stated, why has it not been found among those that died in transit here, or at the stock yard? Why have not the English butchers and inspectors reported it oftener? A few case of actinomycosis, Texas fever, anthrax, and two cases of an uncertain lung disease, are the only diseases worth mentioning I have ever met with among our export animals.

In my regular veterinary practice I occasionally find cases of tuberculosis, mostly within the last five years; but not to any such extent as reported, unless dairies of two cows, or herds of five, in certain cow-houses, are meant to prove the large percentage, when one or two of their number are diseased; neither am I ready to admit that the cows in the neighborhood of the old cities of Europe are healthier than ours.

I am also indebted to the Board of Health of Boston for their latest reports. Dr. Alexander Burr, their dead-meat inspector, has kept an exact account of all the cattle slaughtered at the Brighton Abattoir during the year 1890. The largest percentage of tuberculosis he finds among Eastern cows, where it reaches from three to four per cent; this shows that our cows are as healthy as those of some of the cities of Europe, even where the sanitary regulations are excellent, and have been for years, for their statistics are taken from the dead animal. They do not regard a high-bred herd infected because one or two of its number have been; and at the international meeting these statistics were meant to embrace only those actually diseased.

Among the dead cows in the vicinity of Boston sent to the knackers department to be made into fertilizers, he found 7.5 per cent. Certainly no place could be found where the percentage could possibly be higher, or more unfair as a basis from which to calculate the condition of either the cows or the cattle population.

While it might be that abattoir figures would be slightly favorable, that could not possibly be the case with this class of animals. Among Western cattle he has found only one case of tuberculosis. One of his reports to me was for ten weeks last year, when he found, among 7,000 cattle slaughtered, only seven cases of tuberculosis. His next report to me was for six months. Out of 15,506 cattle slaughtered, he found only 17 (or 17-100ths of one per cent) tuberculosis. Of the above number, 810 were Eastern cows; of these, 3.30 per cent were tuberculous; while among eighty dead cows carted in for fertilizers from the vicinity of Boston, six were found to be tuberculous.

My reason for challenging the statements made in the Review editorial is because they appear to me entirely wrong and unfair to the country, especially when read in foreign countries, where our products are objected to on account of their supposed diseased condition. It interferes with the business of the steamship lines coming here, it injures the stock raisers and shippers, and must be embarrassing to the Bureau of Animal Industry at Washington, which is now doing so much to remove this wrong impression abroad.

WILLIAMSON BRYDER, V. S.

Inspector of British Steamships.

Can these statements of Drs. Bryder and Burr be disproved by Dr. Bailey of Maine and Dr. J. F. Winchester of Lawrence, Mass.? If not, then there is no present cause for alarm, and the measures of the cattle commissioners, if carried forward, will accomplish all that under present conditions is possible.

We have already alluded to the sensational character of the reports which have been circulated respecting our cattle. This is apparent by the language and terms which are used in speaking or writing of it, such,for instance as "dread disease," "most alarming," "shocking," "stands appalled,"and the like. It would appear as if these men thought themselves to be the discoverers of the disease, that *they* only knew its character, and therefore felt it necessary to use the strongest, most stirring words found in or which could be coined from the English language, to arrest public attention and direct it to an impending calamity; whereas, the *fact of the disease*, and all the details of its development and results, were thoroughly well known and understood hundreds of years before their grandfathers were born. It may not have been classed among contagions; but, if it is contagious now, it always was, and always was as dangerous as now, no more and no less. In truth, as many facts can be gathered to prove that it is not contagious, as can be found to prove that it is. But we will admit it to the list of contagions. What then? Contagions differ amazingly in their virility, certainty and mode of transmission, ease with which they may be resisted, period of incubation, etc. Tuberculosis in action is one of the weakest, slowest and most easily averted of any known. When compared with small-pox, yellow fever, measles or diphtheria in man, or foot and mouth disease, Spanish fever, or contagious pleuro-pneumonia in cattle, it hardly deserves to be called a contagion. Rare indeed are the cases of it, both in men and cattle, where the causes of it cannot be traced directly to colds resulting from sudden changes of temperature, confinement in foul air without suitable ventilation, and these combined with weakened vitality, caused by over-breeding, over-working and improper feeding; and this, it is to be noted, is where the principle of this contagion, if it has played any part in the calamity, cannot by any possibility be traced to an origin in any other animal.

As a simple contagion, therefore, or because it is considered such, it is not to be accepted as a "dread disease." As a contagion, it has a germ floating in air, swimming in water, or concealed in our food; but there is no occasion to be "appalled" on that account, for the same is true of measles, chicken-pox, diphtheria and other diseases, and this is the weakest in vitality, and more dependent on a variety of extraneous circumstances for its development than any of them. True, if a contagion, it has a germ or seed; but, that it may grow and cause what is called disease, it must be planted in ground fitted for its reception by a union of many of the conditions which have been named, and over which we have nearly perfect control. It has a germ which can be found by searching with microscopic power, and which, if fed to animals for consecutive weeks or months, or forced into their blood, may be made to incubate; but this process is purely artificial, simply showing what scientific skill may accomplish. It is utterly unlike the processes of nature in the movement of the germ from subject to subject, where a personal defence can be made, or, if need be, assistance given in prevention or resistance.

Again, uneasiness if not alarm has been created by the oft-repeated statement that this disease is certainly hereditary. Facts to contradict this are abundant and pointed. At the present time investigators are quite generally agreed that an animal born of a tuberculous mother does not carry the germs of the disease in its system, but that, being born of a parent with a weakened constitution, it has a predisposition to disease, and, when called on in after life to perform unusual over-taxing labor, or when exposed to the unfavorable surrounding conditions we have named, this, or, in fact, any other disease, is liable to occur. Here, too, by intelligent care and foresight in relation to the required labor and conditions, the feared result may be averted.

LEVI STOCKBRIDGE,
A. W. CHEEVER,
O. B. HADWEN, } *Cattle Commissioners.*

BOSTON, January 6, 1892.

The portion of the above report which we have underlined, furnishes the key-note to the position we in Maine have all the time confidently taken, that the statistics of the Brighton Abattoir are a "delusion and a snare," as far as furnishing any reliable or trustworthy tables from which any fair conclusions could be drawn of the approximate or actual percentage of tuberculosis in Massachusetts; and we claim, without fear of contradiction, that the two classes of cattle of which we complain viz, "high-bred" and "high-priced" cows and bulls, like those that have come to us from North Andover, Wayland and other parts of Massachusetts, which have heretofore been brought into Maine for breeding purposes; and "cheap cattle" such as are exposed weekly for sale in Brighton market, from which were selected the several carloads recently brought here, (and which precipitated the action of our Board to quarantine against Massachusetts), *never reach the abattoir at all*, the latter class being sold to local butchers, in small lots, to be either retailed as "chop-beef," or manufactured into Bolognas and Frankfort sausage, "where there is no system of inspection" and entirely outside the jurisdiction of the Board of Health. As Dr. Burr the inspector himself says, "Of course we must take into consideration that the cows coming here are generally thought to be sound, that is, we do not get all the animals used in the cheaper grades of beef," and in his very first report to the "Board of Health" (after assuming the position of Inspector) for three months ending December 31, 1889, submitted the fact that among the cattle slaughtered, were discovered twelve cases of tuberculosis. Of these he condemned but two animals, and explains, "From the above it will be seen that not all the tuberculous animals have been condemned: and I wish to state that our discrimination might be more rigid were it not for the fact, that in surrounding cities and towns, dissatisfied tenants could slaughter without inspection for our market, and thus defeat the object of our inspection."

No suspicious cattle as such, are ever sent to the abattoir to be slaughtered, as the owners well know they will be inspected.

This is just the class of cattle our dealers have been buying in Brighton, and that are offered there every week for sale, old and young, the lame and the blind, discarded from milk farms around Boston, "*for cause*," some dry, some farrow, some diseased, and only last week offered to us for four and five to six dollars a head, and it is a matter of fact that a carload of them was landed in Maine just before our Notice of Quarantine, that cost but $6.35 per head, freight all paid to "Burnham Junction." Now, we maintain, that if every one of them were perfectly sound, they would still be an unprofitable and worthless lot of worn out brutes for out farmers to invest in, and furnish a parallel case to the miserable lot of Bronchos that infested our State a few years ago, and among whom glanders was so prevalent, that we found thirteen cases within a year. Owing to the system of contracts to furnish so many cans of milk per day, some of these cows are sent to Brighton by milkmen in surrounding towns, only because they can no longer furnish their quota of milk, and have been "pumped dry," but the fact develops, that no matter for what cause they were weeded out, when slaughtered, a large percentage of them prove to be diseased, and we certainly have no use for them in Maine.

This is the class of cattle so well described by Dr. Burr himself, where he says "that when the condition of the old, unthrifty cows in this city and neighborhood is studied, and the class of people to whom their milk and other products are distributed are taken into account, the subject becomes a very serious one, and well worth the immediate attention of our Health Authorities;" and Mr. Cheever himself in a public document dated Dedham, Mass., May 1, 1890, says, "The course indicated for the safety of the farm herds is to secure a stock of healthy animals, and then breed a sufficient number of young to fully supply the home demand. A purchased creature coming from an unknown quarter always may be a source of danger. The oft-repeated story of those who find the disease in their herds is that 'I bought a cow that was thin in flesh and looked badly, but I thought she would improve on my keeping. But, instead, she grew worse and died, and now some of my other cattle have that same bad look.' Never, on any consideration, breed from an animal of either sex on which there is a shadow of suspicion as to the health and vigor of constitution."

Dr. Austin Peters, in a very able address (on January 10, 1891) at the Farmer's meeting in Boston, added his endorsement to these opinions, and said "In the neighborhood of our large cities infection from diseased to healthy cows plays an important part in its spread, there being a constant buying and selling among milkmen, and once it obtains a foothold in a herd it is very difficult to eradicate it.

It is not uncommon in southern New Hampshire, as here there is a constant trade back and fourth with Boston and its outlying cities. Cows that have contracted tuberculosis in or around Boston are sold to New Hampshire farmers when farrow and replaced by new milch ones which are taken back to the city dairies. If a farmer is so unfortunate as to buy one of these consumptives, it is not long before he has a tuberculous herd, as I know of no instance where the saying that 'a little leaven leavens the whole lump' applies so well or so truly as it does here."

* * * * * * *

Having given the "Massachusetts Commissioners" the full benefit of a hearing in this report, we wish to call attention to certain statements and references therein, beginning with their earnest endeavor to report the exact facts obtained by their observations in relation to the extent to which tuberculosis prevails, and the danger therefrom to people by the consumption of stock products.

They begin by quoting from Dr. D. D. Lee of Harvard University, what Dr. Lee says is the opinion of Professor Airlong of the number found diseased in France, (not Massachusetts) and offer the results of no original work of Dr. Lee whatever.

He says: "The chief source of danger, both in animals and men, lies in the inhalation of dust containing the dried sputa, in those localities where the population is dense and the disease prevalent;" and with their customary fairness these commissioners omit entirely the very next sentence, which says 'cattle kept in such localities for milk, in badly ventilated barns, *are diseased sometimes as high as forty per cent to fifty per cent*, and are certainly as liable to contagion from tuberculous human beings as from one of their own kind,' but again says: 'Nor did *I ever know a case where precautions were taken against the infection of cattle or other animals from tuberculous human beings.*'"

Again Dr. Lee says: "All veterinarians who have had the advantage of a modern education in their profession are thoroughly convinced that tuberculosis is a contagious disease."

They next quote from an essay read by Dr. Chapin, M. D., of Springfield, Mass., "that there was much more danger that our cattle would contract the disease from man than that man would contract it from them." That there is no precedent or recognized authority for any such statement as above, while there are a multiplicity of authorities, that the reverse of this is much nearer the truth, can be abundantly proven. Speaking generally, there are three ways by which the disease may be spread. First, by the *inhalation* of dried expectoration, resulting in pulmonary consumption. Second, by *inoculation*; that is, by the bacilli of tuberculosis effecting an entrance through a lesion of the skin, or through the mucous membrane of some part of the body. One of the most perfect illustrations of how this is brought about, is a case of localized tuberculosis of the tongue, given by Dr. Ernst of Harvard.

"A gentleman, perfectly well Thanksgiving Day, so far as he knew, in some way, by eating something infected with tuberculosis, became infected with tuberculosis of the tongue, because he has or has had a nodule half as large again as an English walnut, which is pure tuberculosis, as was shown under the microscope in a piece taken off with the use of cocaine."

The third great method of spreading the disease is by means of the ingesta, or by means of the material that passes through the digestive organs. In this case it is not so easy to diagnose as in the case of tuberculosis of the lung, but it is very common. And, in thinking what is the most universal food that is employed in civilized countries, one does not hesitate a moment before saying milk. It is the only animal product which we use uncooked, in a raw condition. It is the one thing which is used by old and young, in all civilized countries. It is the thing upon which we feed the babies; and it is important, particularly for their sakes, that an investigation should be carried out, in order to show whether or not it may contain the virus of the disease. In this connection, it seems to me that it would be quite proper to speak of the investigations of Dr. E. F. Brush of Mt. Vernon, N. Y., who has taken up this question of the infectiousness of milk for the last few years, not especially from the experimental side, but from the statistical side; and, judging from a paper which he published last year, as the result of investigations carried on for a number of years before, and extending through the statistics of the world, he certainly believes himself, and seems to show, that tuberculosis does not exist among people that do not employ milch cattle. Another side of his investigations, shows that in countries where the milk supply is derived from goats or from mares there is no tuberculosis, which follows out perfectly the natural history of the disease, because neither goats nor mares, are affected by tuberculosis.

Dr. Ernst sent out a circular letter to something like two thousand medical and veterinary practitioners, including members of the Massachusetts Medical Society, Association of American Physicians, and the United States Veterinary Association, to get their opinion on this important question.

It should be said, in summarizing them all, that out of the twelve or thirteen hundred answers that he received there were but two which expressed an absolute disbelief in milk as a vehicle for the virus of tuberculosis; there were a large number of gentlemen who expressed their belief in it; a large number who stated, what is perfectly true, the difficulty of proving such a thing, but expressed their belief in it; and a comparatively small number who furnished him with cases which they believed were distinctly traceable to the milk coming from tuberculous cows.

He had records of cases of probable infection of children from the milk of mothers with tuberculosis of the lung and mamma. He had cases of the infection of children from milk coming from a tuberculous cow. He had a large number of cases from the veterinarians, showing the infection of calves from tuberculous cows; and it seems impossible to resist the conclusion that, notwithstanding the fact that the attention of medical men has not been attracted to this point, excepting within the last year or two, the amount of evidence obtained from the clinical side is very great.

There is not a single case cited by any of these medical experts that endorses Dr. Chapin's statement, but it may be asked how does all this affect Massachusetts? Let us see. Dr. Austin Peters, who was the colleague of Dr. Ernst, M. D., in conducting the experiments at Matapan, under the patronage of the Massachusetts Society, says, "Cattle in the neighborhood of large cities (Boston) are much more the victims of tuberculosis than those kept out on the farms; therefore, while perhaps from *ten to twenty-five per cent* of the milch cows in *Eastern Massachusetts are tuberculous*, it is much more rare in the *western part of the state*, although I do not mean by this to say that it does not exist there."

It is not a little significant, that Dr. Abbott, M. D., of Boston, at the hearing before the committee on public health, February, 1891, in giving the vital statistics of deaths by consumption in Massachusetts, said: "Now, with regard to the difference in different counties of the state; it is true that tuberculosis has prevailed to a greater extent for the whole of this period *in the eastern counties* than *in the western counties*."

In Senate Report No. 3, the Massachusetts Commissioners say: "Having stated a few facts as to what the disease is, its cause, some of the prominent symptoms and the means necessary to combat it, it may be of interest to know to what extent tuberculosis was the cause of death in the human family in this state during the year 1886. According to the registration report for that year, there were

39,040 deaths in this state, and of that number 7,329 died from trom tuberculosis, or 18.37 per cent. From the twelve prominent causes of death, numbering 23,872, tuberculosis claims 30.7 per cent."

The registration report of Massachusetts for the year of 1890 (just published) furnishes full mortality tables of all deaths from specified causes, for the past five years. From these we find the deaths from *tubercular diseases* in 1886 were 7,329 ; in 1887, 7,439 ; in 1888, 7,408 ; in 1889, 7,222 ; in 1890, 7,350 ; a total in five years of 36,748 ; and for fifty years ending December 31, 1890, 270,586. A supplement to the above table gives the number of deaths from "phthisis or consumption" alone, in the several counties for the past five years as follows: Suffolk, 8,328 ; Middlesex, 5,175 ; Essex, 3,752 ; Worcester, 3,207 ; Bristol, 2,172 ; Hampden, 1,542 ; Norfolk, 1,324 ; Plymouth, 1,112 ; Berkshire, 762 ; Hampshire, 603 ; Franklin, 400 ; Barnstable, 388 ; Dukes, 55 ; Nantucket, 48. So it seems that it is a most significant and momentous fact, that in those counties where the *bovine population of Massachusetts is most largely affected*, there follows as an unerring sequel, the greatest percentage of *deaths from consumption among the human family.*

Dr. Clark, M. D., representing the Board of Health of the town of Medford, said, "I will state, as a member of that board, that I have been brought into contact more or less with tuberculosis in cattle, the existence of which is well known to a number of the gentlemen here. We probably have in Medford the worse stock farm in the state of Massachusetts or, possibly, in this country ; that is, I mean by that that the cattle on this farm are probably diseased with tuberculosis to a greater extent than the cattle on any other farm. And, although we knew that fact as far as any one can possibly ascertain it, still our board is powerless to rid the community of that nuisance, if I may use that expression. And the reason for it is this: that the milk from the cows kept on that farm is not sold in Medford. It is sold, probably, in Boston, or that portion of Boston called Charlestown ; and of course, being disposed of in Charlestown, the Medford Board of Health has no power or authority whatever to exercise supervision over the disposal of that milk. The cattle are fed upon refuse grain and swill ; and, while they were quarantined last May, they were fed upon their own milk. The place has been examined by several physicians and several veterinarians, and they all pronounce it as full of germs ; and it is a place that will disseminate disease among cattle, even if they are brought there in a healthy condition. I bring this matter up merely for the purpose of showing you that local Boards of Health have absolutely no power to eradicate this disease, except so far as it may be done by quarantining the cattle. The Cattle Commissioners have seen the place; and they feel this way, that the statutes are not sufficiently definite, that they do not give them sufficient power to warrant their going ahead and treating tuberculous cattle the same as they would treat *cattle affected by farcy or glanders* or affected with contagious pneumonia. The Cattle Commissioners claim—and they take the ground properly, I think—that they hardly feel warranted in taking the same measures that they would in the case of cattle affected with *farcy or glanders*."

When we come to consider that *cattle are never affected with glanders or farcy*, and that they enjoy a perfect immunity from these diseases, we may well understand how much progress is being made in the Bay State, to control the disease.

Dr. Clark, M. D., also said, "Now, as far as the prevalence of tuberculosis is concerned, I can give you the certificate for the town of Medford for the past ten years. We have had from one hundred and ninety to two hundred cases of consumption, or tuberculosis. That cause of death is the most frequent that we have in our town. So that you can see that tuberculosis prevails to a greater extent, and causes more deaths in the town of Medford, and has caused more deaths there within the past ten years, than any other disease. That appears to bear out the statement made by Dr. Ernst very well indeed."

Mr. A. W. West, representing the Board of Health of Salem, said, "I only want to say that there have been within the last year or two, or the last two or three years, two entire herds of cows, fifty in number, that supplied Salem with milk killed, and that they were all found to have tuberculosis; and, in my opinion—and I think that in this I speak for the board—some legislation, whereby these milch herds could be examined from time to time by experts, would be of very great benefit to the community. I have no doubt that the milk from those cows was sold to Salem consumers for some time before the cows were found to be suffering from this disease. I think that, if an act were passed by the Legislature providing for the inspection of milch herds by experts, it would be of great benefit to the community at large."

When we come to consider the question of the use of the flesh of tuberculous animals for human food, we have it on the authority of Lydtin, Fleming and many others, that there existed in the Mosaic laws, strict legislative rules as to the condemnation of the flesh of an animal, or any portion of an animal, affected with this disease. From this time onwards, various ordinances have been instituted with the object of checking the use of consumptive flesh, especially in France and the German states, and even in such countries as Spain, Italy and Switzerland; and severe punishment has at different times been inflicted on butchers and others who have wilfully sold such meat.

That a certain amount of relation exists between the death rate of man and animals respectively from consumption, and that this relation is materially affected by the use of tuberculous flesh for human food, is afforded in a chart issued by the authorities of the Grand Duchy of Baden, in the year 1881. The chart applies to no less than fifty-two towns, and shows that where *tuberculosis is prevalent among cattle, it is equally prevalent among the human population*, and is particularly prevalent in those towns in which the number of low-class butchers is greatest. One remarkable exemption to this is found in the town Wertheim, but it is significantly pointed out that from this town large quantities of sausages, made from flesh of inferior quality, are *annually exported*.

It is the opinion of some authorities that if the tubercle has not commenced to break down the flesh of the animal is not injured, but Prof. Orth of Gottengen, found, when experimenting with the disease, that freshly developed gray tubercle conveyed the disease to nine animals out of fifteen experimented on. Walley says, "The poultry yard, the pigeon loft, and the aviary, (so far as canaries, at least are concerned) are decimated of their occupants to an enormous extent by this fell malady throughout the whole of the country; and Doctor Bland Sutton has shown that while grain-eating birds are most frequently attacked—birds of prey also occasionally fall victims to the disease. Dr. Williams says, "The contagious diseases of man and animals are in many cases identical and intercommunicable, either by contact or by ingestion of parts of the diseased body by the healthy animal, and it is now a well recognized fact, unqualifiedly endorsed by all who are versed in either human or veterinary medicine, that the ingestion of diseased milk and meat, is the *direct cause* of *much disease and death in the human family.* The practically universal use of meat and milk as human food in all civilized countries renders the question of their freedom from disease of pressing import to the health of the nation."

In our opinion meat and milk inspection should be carried out primarily in the interests of the intended consumers of the food products and not, as is too often the case, in the interests of the producer.

I now leave this branch of the Massachusetts Report, and come to the "Worcester Inspection" (?) where "in consequence of unfavorable surmises respecting the condition of the herds of cows which supplied the city of Worcester with milk, the board visited that locality last March, and examined twenty-five herds, containing 850 cows, etc." They report "*the entire herds to be in perfect health.*" It seems that heretofore, Worcester has been a favorite stamping ground for disease, as in 1890, Senate Report, No. 5, the Commissioners say, "During the past year, notices were received from all parts of the state, but the *greater number are from Worcester* and the counties east, indicating that pulmonary trouble of some kind is more prevalent there, or that stock owners are more alert in its detection." And in 1889 they report that Dr. J. Penniman, V. S., cites a case of a herd of thoroughbred Jerseys within seventeen miles of Worcester, where the entire herd was killed and buried, and the barn thoroughly cleansed and disinfected. Although he does not believe it affects every herd within a radius of ten miles of Worcester, he has occasionally found it not only in the city but in almost every adjoining town; and he has no doubt but that it lurks insidiously in many a herd, and perhaps the owners may be ignorant of the fact, but he is quite sure some know they have it and keep very still.

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"But," say the commissioners, "Maine is a large contributor weekly to the stock market at Brighton, and it would not be strange if she contributed her mite to increase the volume of this pest of 'cheap cattle' said to be found there."

Aside from the fact that Maine has no such class of cattle to contribute, let us see what has developed in the only case where a specific charge of this kind has been brought to our attention, that we were able to utterly disprove, and prove instead to be a boomerang to its projectors.

The following notice has been given extensive circulation in the Boston Globe:

"HAVERHILL, January 22. The cases of tuberculosis among cattle owned in this city continue to increase, and it is feared that the disease is becoming general. Mayor Burnham has appointed Inspector Deane inspector of milk as well as of provisions, and has given him orders to visit the farms of the milkmen and examine all cows whose milk is sold in this city. If any of them are diseased, Mr. Deane is to kill them at once. To-day two new cases were discovered in a herd of cows owned by a suburban milk dealer.

"Tuberculosis has already caused a lawsuit between two Haverhill business men. One who resides in Bradford bought a cow of the other. He placed the animal with his other stock and used her milk upon his table. The animal was soon afterward killed and found to be suffering from the malady in a most advanced stage. The cow was supposed by the purchaser to be sound. This cow came from the State of Maine."

Believing the statement that this cow came from Maine to be a "pure canard," we went to Haverhill, and found the cow in question, to have been a Holstein cow, and the defendant in the lawsuit to be a well-known capitalist, Mr. Thomas Sanders. Upon inquiry, we found the cow was purchased of Mr. John B. Ham of North Berwick, whose letter we publish.

"NORTH BERWICK, January 25, 1892.

GEO. H. BAILEY:

Dear Sir: Yours of the 22d is at hand and will say in answer to your questions in regard to the cow I sold Thomas Sanders, that I considered her perfectly well when I sold her to him, I had never even thought of her being sick. I cannot give you any information where she was bred. I had the cow of Wallace Bragdon of Wells, P. O. Address, North Berwick. I have never had any sick animals nor any trouble of any kind. I have one cow now that I had when I sold Mr. Sanders the one in question, and I consider her perfectly well and hearty. Would be pleased to give you more information if I could.

Yours truly,

JOHN B. HAM.

P. S. I had the cow of Wallace Bragdon September 3d, 1891, and shipped her to Mr. Sanders November 3d, making just two months in my possession."

We also offer the letters of Mr. Bragdon of South Berwick, and John W. Barrett of Great Falls, N. H.

"NORTH BERWICK, January 31.

Mr. BAILEY:

Dear Sir: The cow you wished to know about I had of A. I. Goodwin of South Berwick, and he of Robert Barrett of Great Falls, N. H., and I think he bought her somewhere in Massachusetts, but don't know what town.

Yours truly,

WALLACE BRAGDON."

"GREAT FALLS, February 2, 1892.

FRIEND BAILEY:—Yours at hand and will say that the cow you have reference to is one of the herd of the Houghton Farm of Putney, Vt., F. L. Houghton, Proprietor; he sold the stock at auction in Boston. She has the papers with her; name, Prudence 2d. I think she originally came from Massachusetts.

Respectfully,

JOHN W. BARRETT."

The plaintiff in the law suit having been defeated, I now offer what Mr. Sanders had to say in the *Evening Courier* published at Haverhill, and as this gentleman has had considerable experience with the disease in his own herd and lost quite a number of valuable cows, he speaks whereof he knows:

The following communication from Mr. Thomas Sanders throws additional light upon the case of that tuberculosis cow, concerning which so much has been said of late in the newspapers:

"BIRCHBROW, January 21, 1892.

To the Editor of the Gazette:

DEAR SIR—As your paper has contained several allusions to the case of Christie vs. Sanders, I desire to offer a few words of explanation, as Judge Carter's decision that the plaintiff had no case, deprived me of the opportunity of giving my testimony in court. I traded two cows to this man for a horse and wagon, representing that the cows were sound, so far as I knew. One of them proved to be diseased and we traded back, and I had the animal killed, all of which appeared in court on the testimony of plaintiff, which ended the case, as you reported. As, however, the public has had no means of knowing that I did not wilfully dispose of a diseased cow, knowing her to be such, I desire publicly to state that I have taken great pains and been to the expense of over $2000 in endeavoring, so far as in my power lay, to eradicate the especial disease (tuberculosis) with which it is claimed this cow was affected, and that I regard it as a criminal act to knowingly dispose of an animal so affected. I take this means of announcing that I shall endeavor to secure more stringent legislation in regard to the inspection and disposal of such animals than is at present on our statutes, and in this I feel assured I can trust to your earnest co-operation, as the public demands it. Yours truly,

THOMAS SANDERS."

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In summarizing the statements and conclusions, derived from "Official Reports" of the Cattle Commissions, "Boards of Health" and leading veterinarians of Massachusetts, let us see what is the nearest percentage of tuberculosis upon which they all agree, as having prevailed in that state for the past five years. In 1887, Senate Report No. 2, the commissioners said: "The facts of a year ago are in the main the facts of to-day. The disease continues with no apparent abatement or increase, though as the veterinary profession increases in number, and attention is called to it more and more, there is call for more active work. The disease could, doubtless, be eradicated by placing it in the same category with pleuro-pneumonia, and applying to it the same provisions of law; but it would, doubtless, necessitate the destruction of twenty animals to save one, and require the payment of many hundreds of thousands of dollars."

From 1883 to 1887, Mr. J. C. Rogers of Peabody, lost his whole herd, forty four in number.

In 1887, upon the farm of F. L Ames of North Easton, of thirty-six animals nineteen proved diseased.

In 1887, upon the farm of C. S. Emerton of Peabody, he lost his entire herd, forty in number.

In 1888, the Lenox & Stockbridge Land Company lost their entire herd, thirty-two in number.

In 1887–88, Dr. J. Penniman found four herds affected in the vicinity of Worcester, in one instance the entire herd being killed, number not given.

In 1888, an official examination on *thirty-four farms*, where 886 bovines were kept, 239 were found diseased upon post mortem examination, and 189 others were regarded as suspicious, over twenty-eight per cent.

In 1887, Dr. William Rose, D. V. S., United States Inspector of Washington, D. C., *examined two hundred herds, in Massachusetts*, and found over twenty-five per cent affected with tuberculosis, and Dr. Alfred H. Rose, D. V. S., United States Inspector, stationed at Boston, says, "that Suffolk and Middlesex counties in Massachusetts, *are literally overrun with the disease*, and that twenty-five per cent of the state would be a fair estimate."

In 1889, Mr. Francis Blake of Auburndale, in his select herd of ten, found six diseased and a neighbor of his killed three out of seven also badly affected; and in a paper read before the "Thursday Club" he said: "From what I hear, my opinion is that it is hard to find a herd of cattle kept for sale of milk in which there are not cases of tuberculosis; one stands appalled at the immensity of this evil, threatening at every step the community, and crying loudly for redress."

In 1889, Dr. Austin Peters, at Matapan, among eighteen cows (from ten herds, representing eight towns, all within a radius of twenty-five miles of Boston) found nine of them diseased by post mortem examination.

In 1890, Mr. West of the "Board of Health" of Salem, reports two large herds of cows, that had been supplying the city with milk, all found diseased, number not given.

In 1890, Dr. Clark, M. D. of the "Board of Health" of Medford, reported what he considered the worst diseased herd in Massachusetts, number not given.

In 1891, Mr. E. A. Stone, meat inspector of Ashland, reports killing 205 head for beef, out of which he condemned sixteen cases of tuberculosis, and of twenty-two dead cows sent to him, he *found twenty of them diseased*, while Dr. Burr at the "Brighton Abattoir" found the percentage among the same class of cows to be 10.03 per cent.

Dr. Austin Peters, M. R. C. V. S., says, "that while perhaps from ten to twenty-five per cent of the milch cows of eastern Massachusetts are tuberculous, it is much more rare in the western part of the state, although I do not mean by this to say that it does not exist there;" while Prof. Frederick H. Osgood, M. R C. V. S. of Harvard College, (recently of Springfield, Mass.,) says, "in his opinion the disease prevails in the western portion of the state to an equally alarming extent." At the "Industrial School" at Lancaster, in November last, Dr. Peters discovered seven cases of tuberculosis, and regarded several others as suspicious, in a herd of twenty-five animals. At Marlboro' recently, five cows sold by Deacon Goodale to be slaughtered, were all found to be diseased; and at Haverhill, Inspector Dean has recently discovered advanced cases of the malady in several of the suburban milk herds of that city; and not to be charged with "going back of the returns" we add the infinitesimal percentage furnished by Doctor Burr, at the "Brighton Abattoir," among 28,296 head of cattle, *as .19 of one per cent.*

Drs. Bunker, Colburn, Penniman and Hitchings, veterinary surgeons, agree on twenty-five to thirty-three per cent. Dr. Williamson Bryden, "Live Stock Inspector," says, "five per cent in the neighborhood of cities," while Dr. Daniel D Lee of Harvard, says, "in those localities where the disease is prevalent and the population dense, cows kept in badly ventilated barns, are diseased sometimes as *high as forty to fifty per cent.*"

To recapitulate, let us see what Mr. Cheever himself said in the *Boston Herald*, December 29, 1890: "It is asked if the Cattle Commissioners have the power to eradicate the disease from the state, and without hesitation I should say not without building a fence around it high enough and strong enough to keep all living beings subject to the disease, including man himself, out of it till the job was finished. Very few now living could hope to see the fence removed, and unless equally vigorous measures were adopted outside, the first opening would introduce germs to re-stock the state."

It will be noticed that the above statistics are all collected from Massachusetts authorities, the majority of them officially endorsed, and that the grand average of these cases will we found to be *over fifty per cent.* The percentage as officially given in New Hampshire of cattle contributed by Massachusetts is *over thirty-five per cent,* while that of Maine, (by post mortem tests) the percentage of high-bred animals for breeding, and cheap cattle bought in Brighton, combined, amounts to *over forty-four per cent.*

It may be contended that these "Massachusetts cases" are isolated and exceptional ones, and relate to herds and animals most likely to be affected, but they are the only cases officially reported by which we can form an approximate estimate even of the maximum number affected; but if we accept the con-census of opinion of the most conservative veterinarians, the minimum number reached could *not possibly fall below twenty-five per cent*, and this would give the number of milch cows (whose products are being daily consumed in Massachusetts markets) *as forty-four thousand one hundred and nineteen.*

The last report of the census office completed June 1, 1890, gives the number of milch cows in Maine as 158,879 of the value of $4,660,794 and the number of oxen and other cattle as 152,664 valued at $3,776,920; total value $8,437,714.

The number of milch cows in Massachusetts is 176,476, and the number of oxen and other cattle 96,799, the value of the former being $5,774,295 and the latter $2,495,797; total value $8,270,092. It will thus be seen that while Massachusetts has 597 cows in excess of Maine, our State has 55,865 oxen and other cattle in excess of Massachusetts; total number of cattle in Maine, 328,543; total number of cattle in Massachusetts, 273,275.

Comment is unnecessary, and now when Maine and New Hampshire have each taken independent action, in quarantining against the "Old Bay State," the dissembling statement of Mr. Levi Stockbridge, chairman of the Massachusetts Board, that "*the general health and condition of cattle in that state is excellent, and he can positively say there is very little tuberculosis among them,*" is a gratuitous insult to the intelligent community among whom he resides, and too sudden a change of base, to be well received or credited in the latitude and longitude of Maine.

With the destruction of whole herds affected with the disease, at Salem, Worcester, Lenox, Peabody and North Easton, as shown by the Massachusetts Commissioners' own reports, with the sales of other entire herds for slaughter, when found to be diseased, and continuous sales of "tuberculous cattle" and "bob-veal" to be manufactured into "Frankforts and Bolognas" as proven by Massachusetts inspectors and veterinarians, as a matter of protection to the "flocks and herds" of Maine, we say to our own dealers, and all others, that when you come across the borders of this State, in violation of present regulations, with a carload of worthless and diseased animals, they will be quarantined at the owner's expense, until we are satisfied that they will not propagate and extend such disease. Maine has been actively and earnestly engaged in recent years, to free our State from contagious diseases, and we have them under as perfect control as can ever be expected in a population of over three hundred thousand cattle, which is less than four one-hundredths of one per cent (not abattoir statistics) and our law of 1887, granting an appraisal and reasonable compensation to owners of all animals condemned and destroyed, has met with a cheerful compliance with all its requirements, without having to resort to any compulsory action upon our part, to insure a thorough enforcement of its provisions. We send our best horses and cattle to Massachusetts, and receive an annual donation of glanders and tuberculosis in return, and while we do not care *what percentage of animals in Massachusetts are tuberculous only as it affects our State*, we do know that the post mortem tests of cattle that come to us from that state, prove them to be extensively diseased. We also know that while various private individuals, and "boards of health," actively supported by the "Massachusetts Veterinary Association," have for a long time been urging that the state should take the matter in hand, and provide adequate legislation to rid the community of the disease; no such action has been taken, and not a single dollar appropriated to place it under proper supervision and control. This is not a mere question of "dollars and cents" but one concerning the health and happiness of large communities, involving as well the vital statistics of the entire commonwealth.

The veterinary profession of Massachusetts are acting together in perfect harmony in their consultations and recommendations for "sanitary reform," but as long as no appropriation is made to carry on the work, the composition of the board of Cattle Commissioners (whether lay or professional) is of little consequence. No professionals certainly could be expected to examine 850 head of cattle with anything like the rapidity as did the present board at Worcester, although it is barely possible they might have arrived at more correct and satisfactory results. Then again the owners of horses and cattle that proved diseased feel under no obligations to report them to any public officials, as they well know they will receive no compensation if they should be condemned, and I know of veterinary surgeons in good standing who refuse to attend calls from owners who are dependent upon their business for a livelihood, for the simple reason that any action upon their part to condemn such animals would call public attention to the herd, and probably ruin the business of the owner. One of the most prominent of Boston practitioners said to me recently, "I was called by a client of mine to see a sick animal, and as he had lost several cows with the same symptoms, wanted to know the truth. I found the cow badly diseased and held an autopsy to satisfy the owner; since then, when he has another case, he knows the symptoms as well as I, and disposes of the animal at the best price obtainable, and as Mr. Stone says, 'the public can guess at what they are eating.'" So it seems they buy and sell diseased cattle, and eat and drink their products, without legal or official restraint, just as we have alleged, but in pursuing our investigations for our own protection, it has been in no unfriendly spirit, and the criticisms we have felt obliged to offer are suggestive rather than restrictive, and we occupy a position of neutrality and not hostility towards Massachusetts. With a board of Cattle Commissioners (however respectable) not one of whom could tell a case of tuberculosis if they saw it in their own dooryard and now passing through a comatose condition of inactivity and dismemberment, an appropriation however liberal, would be productive of but little good, but should there be appointed a board of intelligent and experienced commissioners, with a fair comprehension of the importance and magnitude of the task before them, they would soon be able to throttle the unfettered monster now sleeping in their midst, only to become hydra-headed by further procrastination and neglect.

With a board of "inspectors who can inspect" it would very soon be demonstrated that our board have made no "false or invidious charges against Massachusetts" or published "exaggerated statements" as alleged by the present board of Cattle Commissioners, and we most confidently rest our case, relying upon the undisputed facts we have collected, presented and proven, as the only justification we shall ever need, in having quarantined our State against Massachusetts.

GLANDERS.

In summarizing our cases of glanders for the past year, our report shows, we have condemned and destroyed eighteen horses at an appraisal of $1,480, but two of which were bred in Maine, while five of them came to us from Massachusetts. In 1890 we killed the same number of horses as in 1891, but one of which was a Maine bred horse, again proving conclusively that we have no disease among our home-bred stock. Among the five that came to us last season from Boston, were three cases that deserve especial mention, as they were found among a class that seem to be largely upon the increase in this State, due in a great measure as we believe to the facilities offered unprincipled dealers to advertise these "green-goods" in such leading Boston papers as the *Globe* and *Herald*, the very fact that these "ads." are found in papers of such enormous circulation, being accepted by their readers as an endorsement that they are genuine instead of spurious in character.

* * * * * * * *

Walley says of glanders and farcy: If it were not for the fact that horse-flesh is sometimes used as an article of consumption, or rather, is largely sold as such under the guise of ox beef, the question of glanders need not have claimed attention in connection with the subject at present under consideration.

Essentially an equine affection this fearful and intractable malady equalled in this respect by syphilis alone is readily propagated by inoculative contagion (and, according to some authorities, by infection) to the human subject, though there is no case on record in this country, so far as I am aware, in which it has been so conveyed by ingestion of the flesh of diseased animals. This may be probably due to the fact that horse-flesh is so seldom used as an article of food, and, consequently, if such transmission had at any time occurred, it might easily have been overlooked. For a very long period proprietors of menageries have entertained an overwhelming dread of the effects of horse-flesh on the carnivora in their establishments, and that, too, on account of their belief that glanders is transmitted by the uncooked flesh of infected animals to such of their beasts as may be fed on it; and they invariably make a searching inquiry into the antecedents of the animal whose carcass they may purchase for feeding purposes.

Fortunately, glanders does not arise as an indigenous affection in cattle, neither can it be transmitted to bovines, though a statement has recently been made to the effect that sheep do not possess immunity from the disease.

Personally, I have never met with a single instance of disease in cattle that I could in any way identify as of glanderous origin, and I am quite satisfied that the cases which have from time to time been placed on record were cases either of pyæmia, or more probably, of malignant catarrh.

Glanders and farcy are one and the same disease, the local manifestations of their existence in the system alone presenting distinctive characters; the former having its lesions mainly localized in the respiratory tract, the latter mainly in the cutaneous and subcutaneous structures and in the superficial lymphatics. It is due to a specific organism, a bacillus, which seems to find a favorable pabulum for its development mainly in the tissues and juices of the equine species. It is to the pathogenic effects of this organism that the local lesions of glanders and farcy are due. In the acute form of the disease febrile conditions are pronounced, there is usually a profuse catarrhal discharge from the nostrils, diffulent ulceration of the lining membrane of the nasal chambers the ulcers as shown in the illustrations, having a very angry appearance, enlargement of the sub-maxillary lymphatic glands, and, occasionally, specific inflammation and rapid degeneration of the glands of the groin (inguinal) with the adjacent muscular tissues, constituting glanders tumour. In the internal organs, the lesions are localized in the lungs, and consist of consolidation, congestion, effusion, and the formation of the characteristic miliary tubercles and abcesses, distributed mainly in a racemose manner.

In chronic glanders, the characteristic symptoms are an agglutinous discharge from one nostril with slight enlargement and hardening of the sub-maxillary lymphatic gland on the same side; a pale (anaemic) or bluish (cyanotic) colour of the mucous membrane of the nose, with the development of glanders ulcers thereon; the latter being most largely found on that part of the membrane covering the septum of the nose. The affected animal may be in splendid condition, and, if there is no fever, the muscular tissue may present after death, no appreciable departure from the normal; on the contrary, the animal may be more or less emaciated, and the carcass, as a result, deficient in flesh which may be pale in color, or even dropsical. The lungs, in the large majority of cases, are studded with the miliary nodules of the disease; but they are not always distinguishable from other nodular formations by visual examination, even by experts.

Farcy may be acute or chronic. The former is characterized by a markedly febrile condition of the system, and by rapid swelling of one or more limbs, which may be only the forerunner of the pathognomonic lesions of the disease, viz: the so-called farcy buds-nodular swellings about the size of a cherry formed along the course of the lymphatics, which burst and discharge a yellowish-colored, synovia-like fluid, the eruption being followed by an angry-looking sore, the fluid discharge from which possesses specific characters. Chronic farcy is usually a febrile, and here also there is swelling of one or more limbs, but the tumefaction is much less inflammatory than it is in the acute form. The lymphatic vessels too become swollen and nodular swellings (farcy buttons) form at intervals along their course, which, like those of acute farcy, undergo softening, discharge a glairy fluid, and form a specific sore. These lesions may be distributed more or less, over the surface of the body, particularly on the sides of the neck, the withers and the back.

As in glanders, so in farcy, the animal may be in splendid condition ; on the other hand, it may be anaemic and emaciated, and its tissues may be dropsical. The local lesions of farcy may be readily mistaken for those of pyaemia or *vice versa*.

Energetic inspection of all stables, in places where the disease is known to exist, should be carried out, and the law strictly enforced, in order that there may not be the slightest possibility of such a repulsive and intractable malady being conveyed to the human subject, either by contagion from the live animal, or by ingestion of its flesh.

Upon the whole, the condition and freedom from disease among the "flocks and herds" of Maine, has been most gratifying, and while no cases of "contagious pleuro-pneunomia," or actinomycosis, have ever made their appearance in this State, we have also been singularly exempt from anthrax, trichina, hog cholera, "foot and mouth" disease, rabies, or any prevailing epidemic or contagion, such as has visited less favored localities, and we enter upon the business of the new year with renewed courage that we will be able to maintain that high degree of health we have heretofore enjoyed.

[Signed] THOMAS DAGGETT, *President.*
F. O. BEAL, *Treasurer.*
GEORGE H. BAILEY, *D. V. S.*
State Veterinary Surgeon.

ANNUAL REPORT

OF THE

Maine State College

Agricultural Experiment Station.

1891.

MAINE STATE COLLEGE.

AGRICULTURAL EXPERIMENT STATION.

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A. M. Shaw.... .... Foreman on Farm.
Mrs. J. Hamlin Waitt.............. ...Stenographer and Clerk.

REPORT.

INSPECTION OF FERTILIZERS.

The inspection of fertilizers by the Maine Experiment Station for the year 1891 has required the analysis of sixty-four brands of mixed fertilizers and two brands of bone, involving the selection of one hundred and thirty-five samples. The number of brands inspected in 1890 was sixty-four. In order to secure these samples, it has been necessary to send an agent into nearly every section of the State, and during the present season he has occupied the equivalent of the entire time of a month in constant travel. Samples were taken in thirty-two cities and townships, often at several points in the same township. An effort is made to begin this work in March, but it is usually found that new goods have been shipped to but few places so that a successful canvass of the State can not be carried on until April, therefore the completion of the sampling and analytical work cannot be reached until late in June. It will be noticed that three samples of each brand have not been secured in all cases.

In general this has been owing to the following causes: Selling of the fertilizer at but very few points, and finding only the goods held over from last year's sales in the hands of nearly all the agents visited.

SELECTION OF SAMPLES.

Samples for 1891 were selected by Mr. W. J. Holden, an agent of the Station, acting under its instructions. The samples were drawn from three or four packages, mostly one hundred pound bags, so that in all cases where three samples were taken the analysis represents from nine to twelve packages of the goods.

The drawing of the samples is accomplished by means of a sampling tube which can be made to reach every portion of the package, and as several drafts are made from each package, it is readily seen that the method of taking samples is a very thorough one, and there is no good reason for supposing that the contents of the glass jar that is forwarded to the Station does not fairly represent the goods sampled. In every instance a sample exactly similar in composition to the one taken to the Station is left in the hands of the agent selling the goods, thus giving the manufacturers an opportunity, by procuring an analysis of this sample, to check the analytical work of the Station.

THE TRADE VALUES OF FERTILIZERS FOR 1890.

The trade values given below which are used by this Station are those "agreed upon by the experiment stations of Massachusetts, New Jersey, and Connecticut for use in their respective states during 1891. The valuations obtained by use of the following figures will be found to agree fairly with the *average retail price* at the large markets of standard raw materials such as:"

Sulphate of Ammonia,	Azotin,
Nitrate of Soda,	Ammonite,
Dried Blood,	Dry Ground Fish,
Muriate of Potash,	Bone or Tankage,
Sulphate of Potash,	Ground So. Carolina Rock,

Plain Superphosphates.

	Cts. per lb.
Nitrogen in ammonia salts	18½
nitrates	14½
Organic nitrogen in dry and fine ground fish, meat and blood	15½
in cotton seed meal and castor pomace	15
in fine bone and tankage	15
in fine medium bone and tankage	12
in medium bone and tankage	9½
in coarser bone and tankage	7½
in hair, horn shavings and coarse fish scrap	7
Phosphoric acid, soluble in water	8
ammonium citrate	7½
in dry ground fish, fine bone and tankage	7
in fine medium bone and tankage	5½
in medium bone and tankage	4½
in coarser bone and tankage	3
Potash as high grade sulphate, and in forms free from muriate (or chlorides)	5½
as muriate	4½

"These trade values are the average prices at which in the six months preceding March the respective ingredients could be bought at retail for cash in our large markets, Boston, New York and

Philadelphia, in the raw materials which are the regular source of supply. They also correspond to the average wholesale prices for the six months ending March 1st, plus about 20 per cent in case of goods for which we have wholesale quotations."

The sale of "standard raw materials" in Maine is too small to allow an estimation of values upon the basis of local market prices, so the figures as agreed upon in other New England States, where the subject is very ably and thoroughly studied, are taken for use by this Station.

THE VALUATION OF SUPERPHOSPHATES AND MIXED GOODS.

These trade values are applied to the valuation of superphosphates and all mixed goods, as follows:

It is assumed that the organic nitrogen of these goods has for its source such materials as dried blood, ground fish, or nitrogenous substances of equally good quality, unless a special examination of some particular brand shows that inferior material like leather has been used. Organic nitrogen in mixed goods is therefore valued at fifteen and one-half cents per pound. As nitrogen in nitrates is rated for 1891 at only a cent less per pound than organic nitrogen, and as with but few exceptions the nitrates are present in very small quantities, no difference has been made in computing the "estimated value" between organic and nitric nitrogen, but both have valued at fifteen and one-half cents. The small increase in the "estimated value" thus caused, while slightly favorable to certain manufacturers, can certainly do the consumer no serious harm. The nitrogen present in ammonia salts is reckoned at eighteen and one-half cents.

The insoluble phosphoric acid of mixed fertilizers is reckoned at two cents per pound, coming as it does largely from mineral phosphates, and in any case being much the least valuable portion of the original material.

The potash is valued at the price of that ingredient in the muriate, unless the chlorine present in the fertilizer is not sufficient to combine with it, in which case the excess of potash is reckoned at the price of the sulphate.

The valuation of a fertilizer is obtained by multiplying the percentages of the several ingredients by twenty (which gives the pounds per ton), and these products by the prices per pound, and the sum of the several final products is the market value of the fertilizing ingredients in one ton. For instance the "station valuation" of a certain fertilizer was obtained as follows:

2.34 per cent.	nitrogen	equal	46.8 lbs.	per ton	at $15\frac{1}{2}$ cts	....	$7 25
5.05 "	sol. phos. acid	"	101.0 lbs.	"	at 8 cts	....	8 08
1.48 "	rev. "	"	29.6 lbs.	"	at $7\frac{1}{2}$ cts	....	2 22
1.96 "	insol. "	"	39.2 lbs.	"	at 3 cts	....	1 18
5.12 "	potash	"	102.4 lbs.	"	at $4\frac{1}{2}$ cts	....	4 61
Valuation						....	$23 34

CHANGE IN METHOD.

In past years separate analyses have been made of the three samples representing the same fertilizer. This year and last, equal quantities of the three samples have been mixed, and an analysis of this mixture has been assumed to give the same result as would be reached by averaging the analyses of the three samples, a method which is undoubtedly correct.

Description of Samples.

Station number.	Brand.	Manufacturer.	Sampled at	Station number.
784	Allen Fertilizer	American Manufacturing Company, Boston, Mass.	Saco	784
738	Allen Corn Fertilizer	American Manufacturing Company, Boston, Mass.	Caribou	738
787	Allen Fertilizer for Lawn	American Manufacturing Company, Boston, Mass.	Saco	787
737 786	Allen Potato Fertilizer	American Manufacturing Company, Boston, Mass.	Caribou Saco	737 786
782 796 806	Americus Ammoniated Bone Superphosphate	Williams and Clark Company, New York, N. Y.	Kennebunk Portland Oxford	782 796 806
770 789	Bay State Superphosphate	J. A. Tucker and Company, Boston, Mass	Dexter Knightsville	770 789
731 776 778	B. D. Sea Fowl Guano	Bradley Fertilizer Company, Boston, Mass.	Presque Isle Gorham Alfred	731 776 778
811	Bowker's Ammoniated Bone Phosphate	Bowker Fertilizer Company, Boston, Mass.	Bridgton	811
720 761 766	Bowker's Hill and Drill Phorphate	Bowker Fertilizer Company, Boston, Mass.	Bowdoinham Foxcroft Dexter	720 761 766
817	Bowker's Potato Phosphate	Bowker Fertilizer Company, Boston, Mass.	Richmond	817
721	Bowker's Sq Brand, Bone and Potash	Bowker Fertilizer Company, Boston, Mass.	Bowdoinham	721
760	Bowker's Sure Crop Bone Phosphate	Bowker Fertilizer Company, Boston, Mass.	Foxcroft	760

Results of Analyses.

Station number.	Brand.	Moisture—%	Nitrogen—%	Phosphoric Acid. Soluble—%	Phosphoric Acid. Reverted—%	Phosphoric Acid. Insoluble—%	Phosphoric Acid. Total—%	Phosphoric Acid. Available—%	Potash—%	Station Valuation. Value of nitrogen.	Station Valuation. Value of phosphoric acid.	Station Valuation. Value of potash.	Station Valuation. Total valuation.
784	Allen Fertilizer	13.65	2.36	4.96	1.68	2.10	8.74	6.64	4.59	$7 79	$11 30	$4 13	$23 22
738	Allen Corn Fertilizer	15.71	2.39	4.86	1.96	1.82	8.64	6.82	4.91	8 00	11 44	4 42	23 86
787	Allen Fertilizer for Lawns	17.92	2.59	4.20	1.56	2.67	8.43	5.76	4.14	8 57	10 13	3 73	22 43
737	Allen Potato Fertilizer	16.08	2.46	4.34	1.65	2.16	8.15	5.99	4.73	8 12	10 27	4 26	22 65
782	Americus Ammoniated Bone Superphosphate	12.59	2.56	6.95	2.82	2.28	12.05	9.77	2.24	7 94	16 26	2 02	26 22
770	Bay State Superphosphate	14.14	2.59	1.94	5.57	3.66	11.17	7.51	2.96	8 03	12 91	2 66	23 60
731	B. D. Sea Fowl Guano	13.26	2.45	6.49	2.38	1.93	10.80	8.87	3.05	7 59	14 72	2 74	25 05
811	Bowker's Ammoniated Bone Phosphate	10.30	2.57	6.86	2.21	2.09	11 16	9.07	2.00	7 97	15 13	1 80	24 90
720	Bowker's Hill and Drill Phosphate	10.88	2.65	6.87	2.53	3.19	12.59	9.40	2.13	8 21	16 05	1 92	26 18
817	Bowker's Potato Phosphate	13.40	2.01	5.42	4.57	3.93	13.92	9.99	6.89	6 23	17 09	7 40	30 72
721	Bowker's Square Brand Bone and Potash	5.76	1.54	1.91	5.16	8.00	15.07	7.07	2.32	4 77	14 02	2 09	20 88
760	Bowker's Sure Crop Bone Phosphate	12.62	.98	7.09	3.53	3.95	14.57	10.62	1.10	3 04	18 21	99	22 24

Description of Samples.

Station number.	Brand.	Manufacturer.	Sampled at	Station number
689 775	Bradley's Complete Manure	Bradley Fertilizer Company, Boston, Mass.	Bangor Gorham	680 775
690 713	Bradley's Eureka Seeding Down Fertilizer	Bradley Fertilizer Company, Boston, Mass.	Bangor Belfast	690 713
691 714 725	Bradley's Potato Manure	Bradley Fertilizer Company, Boston, Mass.	Bangor Belfast Augusta	691 714 725
692 712 726	Bradley's X. L. Superphosphate	Bradley Fertilizer Company, Boston, Mass.	Bangor Belfast Augusta	692 712 726
820	Buffalo Fertilizer	Milsom Rendering & Fertilizer Co., E. Buffalo, N Y	Gardiner	820
753	Buffalo Hop, Tobacco and Potato Phosphate	Milsom Rendering & Fertilizer Co., E. Buffalo, N Y	Houlton	753
765 771	Buffalo New Rival Ammoniated Superphosphate	Wheeler & Sheldon, General Agents, Rutland, Vt.	Dexter Windham Ctr.	765 771
755 793 837	Clark's Cove Bay State Fertilizer	John S. Reese & Company, New Bedford, Mass	Houlton Portland Bangor	755 793 837
715 836	Clark's Cove G. G Fertilizer	John S. Reese & Company, New Bedford, Mass.	Rockland Bangor	715 836
779 700	Clark's Cove Bay State Seeding Down Fertilizer	John S. Reese & Company, New Bedford, Mass.	South Berwick Portland	779 790

Results of Analyses.

Station number.	Brand.	Moisture—%	Nitrogen—%	Phosphoric Acid. Soluble—%	Phosphoric Acid. Reverted—%	Phosphoric Acid. Insoluble—%	Phosphoric Acid. Total—%	Phosphoric Acid. Available—%	Potash—%	Station Valuation. Value of nitrogen.	Station Valuation. Value of phosphoric acid.	Station Valuation. Value of potash.	Station Valuation. Total valuation.
689	Bradley's Complete Manure	11.25	3.69	5.85	2.44	2.25	10.54	8.29	6.49	$11 90	$13 92	$5 84	$31 66
690	Bradley's Eureka Seeding Down Fertilizer	9.04	2.06	2.61	2.94	7.00	12.55	5.55	2.31	6 39	11 39	2 08	19 86
691	Bradley's Potato Manure	12.83	2.76	4.99	2.23	2.15	9 37	7.22	5.14	8 56	12 18	4 63	25 37
692	Bradley's X. L. Superphosphate	13.77	2.71	7.39	2.94	1.60	11.93	10.33	2.21	8 83	16 87	1 99	27 69
820	Buffalo Fertilizer	8.67	2.38	5.28	1.32	2.43	9.03	6.60	1.43	7 38	11 40	1 27	20 05
753	Buffalo Hop, Tobacco and Potato Phosphate	9.93	2.43	5.35	1.47	2.17	8.99	6.82	4.92	7 53	11 63	4 43	23 59
765	Buffalo New Rival Ammoniated Superphosphate.	12.10	1.46	6.05	3.34	2.11	11.50	9.39	1.31	4 52	15 53	1 18	21 23
755	Clark's Cove Bay State Fertilizer	14.84	2.70	4.16	5.58	.93	10.67	9.74	2.16	8 66	15 40	1 94	26 00
715	Clark's G G Fertilizer	13.67	1.93	3.97	6.49	.63	11.09	10.46	1.54	5 98	16 33	1 39	23 70
779	Clark's Bay State Seeding Down Fertilizer	12.28	1.81	3.07	4.71	4.54	12.32	7.78	2.78	5.61	13.82	2.50	21.93

Description of Samples.

Station number.	Brand.	Manufacturer	Sampled at	Station number.
769 772 777	Crocker's Ammoniated Corn Phosphate	Wheeler and Sheldon, General Agents, Rutland, Vt.,	Dexter Windham Centre South Berwick	769 772 777
688 710	Cumberland Bone Superphosphate	Cumberland Bone Company, Portland, Maine	Bangor Belfast	688 710
730 750 818	Cumberland Potato Fertilizer	Cumberland Bone Company, Portland, Maine.	Presque Isle Fort Fairfield Richmond	730 750 818
827	Cumberland Seeding Down Fertilizer	Cumberland Bone Company, Portland, Maine	Skowhegan	827
719 764 826	Dirigo Fertilizer	Sagadahoc Fertilizer Company, Bowdoinham, Me	Bowdoinham Dexter Skowhegan	719 764 826
751	Economical Bone Fertilizer	Williamson and Company	Fort Fairfield	751
728 821	E. F. Coe's Ammoniated Bone Superphosphate	E. Frank Coe, New York, N. Y	Augusta Skowhegan	728 821
706 729 752	E. F. Coe's Grass and Grain Superphosphate	E. Frank Coe, New York, N. Y	Belfast Augusta Houlton	706 729 752
711 746 822	E. F. Coe's High Grade Ammoniated Bone Superphos.,	E. Frank Coe, New York, N. Y	Belfast Fort Fairfield Skowhegan	711 746 822
747	E. F. Coe's Potato Fertilizer	E. Frank Coe, New York, N. Y	Fort Fairfield	747

Results of Analyses.

Station number.	Brand.	Moisture—%	Nitrogen—%	Phosphoric Acid. Soluble—%	Reverted—%	Insoluble—%	Total—%	Available—%	Potash—%	Station Valuation. Value of nitrogen.	Value of phosphoric acid.	Value of potash.	Total valuation.
769	Crocker's Ammoniated Corn Phosphate.........	12.50	2.14	5.35	4.85	2.20	12.40	10.20	1.36	$6 63	$16 71	$1 22	$24 56
688	Cumberland Bone Superphosphate	9.12	2.31	5.00	5.91	3.42	14.33	10.91	2.28	7 16	18 23	2 38	27 77
730	Cumberland Potato Fertilizer.......	8.59	2.81	4.76	5.56	3.13	13.45	10.32	6.43	8 71	17 33	5 79	31 71
827	Cumberland Seeding Down Fertilizer..........	6.09	1.59	2.48	6.11	10.52	19.11	8.59	.90	4 93	17 33	81	23 37
719	Dirigo Fertilizer	6.40	3.62	.08	1.58	3.46	5.12	1.66	4.20	11 22	3 88	3 78	18 88
751	Economical Bone Fertilizer	7.32	1.02	4.40	2.30	1.13	7.83	6.70	2.32	3 16	10 94	2 09	16 19
728	E F. Coe's Ammoniated Bone Superphosphate...	10.71	1.74	7.93	2.15	1.70	11.78	10.08	1.20	5 39	16 59	1 21	23 19
706	E. F Coe's Grass and Grain Fertilizer	14.16	.60	9.59	2.23	1.06	12.88	11.82	1.24	1 86	19 10	1 36	22 32
711	E F. Coe's High Grade Amm. Bone Superphos...	9.36	2.36	8.29	2.12	1.39	11.80	10.41	2.12	7 74	17 00	2 33	27 07
747	E. F. Coe's Potato Fertilizer	10.24	2.24	7.00	1.32	1.20	9.52	8.32	5.87	7 36	13 66	5 28	26 30

Description of Samples.

Station number.	Brand.	Manufacturer.	Sampled at	Station number.
767	E. F Coe's Standard Brand	E Frank Coe, New York, N. Y.	Dexter	767
695	Farrar's Potato Phosphate	F. S. Farrar and Company, Bangor, Maine	Bangor	695
696	Farrar's Superphosphate	F. S. Farrar and Company, Bangor, Maine	Bangor	696
839			Brewer	839
722	Gloucester Fish and Potash	Bowker Fertilizer Company, Boston, Mass.	Bowdoinham	722
759	King Phillip's Alkaline Guano	John S. Reese and Company, New Bedford, Mass	Dover	759
792			Portland	792
833			Oxford	833
756	May Flower Fertilizer	John S. Reese and Company, New Bedford, Mass.	Houlton	756
705	Nobsque Guano	W. D. Stewart and Company, Boston, Mass.	Belfast	705
800			Portland	800
823	Original Coe's Superphosphate of Lime.	Bradley Fertilizer Company, Boston, Mass.	Skowhegan	823
741	Pilgrim Fertilizer	John S. Reese and Company, New Bedford, Mass.	Caribou	741
754			Houlton	754
780			S Berwick	780
733	Potato, Tobacco and Hop Phosphate	Wheeler and Sheldon, General Agents, Rutland, Vt	Presque Isle	733
749			Fort Fairfield	749
768			Dexter	768
698	Potato Phosphate	Williams and Clark Company, New York, N. Y.	Belfast	698
739			Caribou	739
781			Kennebunk	781
805			Oxford	805

Results of Analyses.

Station number.	Brand.	Moisture—%	Nitrogen—%	Phosphoric Acid: Soluble—%	Phosphoric Acid: Reverted—%	Phosphoric Acid: Insoluble—%	Phosphoric Acid: Total—%	Phosphoric Acid: Available—%	Potash—%	Station Valuation: Value of nitrogen.	Station Valuation: Value of phosphoric acid	Station Valuation: Value of potash.	Station Valuation: Total valuation.
767	E F. Coe's Standard Brand	10.07	1.76	8.21	2.07	1.39	11.67	10.28	1.10	$5 46	$16 83	$1 21	$23 50
695	Farrar's Potato Phosphate	12.16	2.56	4.76	4.86	3.11	12.73	9.62	1.89	8 20	16 15	1 70	26 05
696	Farrar's Superphosphate	10.52	2.76	5.95	4.06	3.04	13.05	10.01	1.87	8 56	16 83	1 68	27 07
722	Gloucester Fish and Potash	11.45	1.01	6.74	3.87	3.86	14.47	10.61	1.08	3 13	18 12	97	22 22
759	King Phillip's Alkaline Bone	12.45	1.80	3.17	5.02	3.86	12.05	8.19	2.90	5 58	14 14	2 61	22 33
756	May Flower Fertilizer	12.05	2.21	5.54	3.80	3.25	12.59	9.34	2 07	6 85	15 86	1 86	24 57
705	Nobsque Guano	4.87	1.15	6.17	2.22	1.71	10.10	8.39	1.72	3 56	13 88	1 92	19 36
823	Original Coe's Superphosphate of Lime	10.15	2.29	7.37	2.02	2.42	11 81	9.39	2.41	7 10	15 79	2 17	25 06
741	Pilgrim Fertilizer	14.62	1.81	4.26	4.48	2.88	11.62	8.74	2.42	5 61	14 69	2 18	22 48
733	Potato, Tobacco and Hop Phosphate	12.54	2.13	6.51	3.25	2.41	12.17	9.76	3.16	6 60	16 25	2 84	25 69
698	Potato Phosphate	11.26	2.74	5.10	1.99	2.00	9.09	7.09	4.77	8 49	11 94	4 29	$24 72

Description of Samples.

Station number.	Brand.	Manufacturer.	Sampled at	Station number.
736	Powell's Prepared Chemicals for Potatoes and Vegetables	W. S. Powell & Co.	East Washburn	736
799	Quinnipiac Grass Fertilizer	Quinnipiac Grass Fertilizer Co , New London, Conn.	Portland	799
773	Quinnipiac Phosphate	Quinnipiac Grass Fertilizer Co., New London, Conn.	Gorham	773
783			Biddeford	783
788			Knightsville	788
701	Quinnipiac Potato Manure	Quinnipiac Grass Fertilizer Co., New London, Conn.	Belfast	701
732			Presque Isle	732
745			Fort Fairfield	745
774	Quinnipiac Seeding Down Manure	Quinnipiac Grass Fertilizer Co., New London, Conn.	Gorham	774
797			Portland	797
791	Reese Concentrated Potato and Corn Manure	John S. Reese & Co., New Bedford, Mass.	Portland	791
699	Royal Bone Phosphate	Williams & Clark Co., New York, N. Y.	Belfast	699
801			Portland	801
744	Sagadahoc Special Potato Fertilizer	Sagadahoc Fertilizer Co., Bowdoinham, Me.	Fort Fairfield	744
807			South Paris	807
819			Richmond	819
716	Sagadahoc Superphosphate	Sagadahoc Fertilizer Co., Bowdoinham, Me.	Bath	716
717			Bowdoinham	717
808			South Paris	808
697	Soluble Pacific Guano	W. D. Stewart & Co., Boston, Mass.	Belfast	697
735			Presque Isle	735
740			Caribou	740

Results of Analyses.

Station number.	Brand.	Moisture—%	Nitrogen—%	Phosphoric Acid. Soluble—%	Reverted—%	Insoluble—%	Total—%	Available—%	Potash—%	Station Valuation. Value of nitrogen.	Value of phosphoric acid.	Value of potash.	Total valuation.
736	Powell's Prepared Chemicals for Potatoes and Vegetables	11.04	1.77	5.33	1.20	.52	7.05	6.53	6.38	$ 6 15	$10 54	$5 74	$22 43
799	Quinnipiac Grass Fertilizer	21.97	3.41	2.72	4.94	1 91	9.57	7.66	2.91	10 57	12 52	2 62	25 71
773	Quinnipiac Phosphate	16.68	2.98	3.13	9.19	1.84	14.16	12.32	1.86	9 49	19 52	1 67	30 68
701	Quinnipiac Potato Manure	11.17	2.71	5.32	1.78	1.84	8.94	7.10	5.17	8 40	11 92	4 65	24 97
774	Quinnipiac Seeding Down Manure	16.[illegible]2	1.45	4.35	6.71	1.83	12.89	11.06	2.03	4 49	17 75	1 84	24 08
791	Reese Concentrated Potato and Corn Manure	12.90	3.04	4.38	3.18	.69	8.25	7.56	8.19	9 42	12 05	7 37	28 84
699	Royal Bone Phosphate	9.43	1.28	6.22	2.49	1.30	10.01	8.71	1.84	3 97	14 20	1 92	20 09
744	Sagadahoc Special Potato Fertilizer	9.28	3.37	4.58	1.06	.83	6 47	5.64	4.52	11 29	9 25	4 54	25 08
716	Sagadahoc Superphosphate	10.60	3.01	7.37	1.66	.67	9.70	9.03	2.49	9 94	14 54	2 24	26 72
697	Soluble Pacific Guano	12.42	2.76	6.74	2.39	2.26	11.39	9.13	2.62	8 56	15 26	2 36	26 18

Description of Samples.

Station number.	Brand.	Manufacturer.	Sampled at	Station number.
707	Standard A Brand Seeding Down Fertilizer	Standard Fertilizer Company, Boston, Mass.	Belfast	707
804			Cumberland Ctr.	804
815			Portland	815
709	Standard Fertilizer	Standard Fertilizer Company, Boston, Mass.	Belfast	709
743			Fort Fairfield	743
757			Houlton	757
802			Cumberland Ctr.	802
708	Standard Guano	Standard Fertilizer Company, Boston, Mass	Belfast	708
742			Fort Fairfield	742
803			Cumberland Ctr.	803
694	Stockbridge's Corn, Grain and Fodder Corn Manure	Bowker Fertilizer Company, Boston, Mass.	Bangor	694
724			Bowdoinham	724
762			Foxcroft	762
814	Stockbridge's Grass Top Dressing	Bowker Fertilizer Company, Boston, Mass.	Bridgton	814
813	Stockbridge's Manure for Fruit	Bowker Fertilizer Company, Boston, Mass.	Bridgton	813
809	Stockbridge's Manure for Beans	Bowker Fertilizer Company, Boston, Mass.	Harrison	809
785	Stockbridge's Manure for Seeding Down	Bowker Fertilizer Company, Boston, Mass.	Saco	785
825			Skowhegan	825
693	Stockbridge's Potato and Vegetable Manure	Bowker Fertilizer Company, Boston, Mass.	Bangor	693
734			Presque Isle	734
763			Foxcroft	763
812			Bridgton	812
758	Sturtevant's Granulated Tobacco and Sulphur	F. C. Sturtevant, Hartford, Conn.	Dover	758
816			Portland	816
824			Skowhegan	824
810	World of Good Raw Bone Superphosphate	Thompson and Edwards Fertilizer Company	Harrison	810

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Results of Analyses.

Station number.	Brand.	Moisture—%	Nitrogen—%	Phosphoric Acid. Soluble—%	Reverted—%	Insoluble—%	Total—%	Available—%	Potash—%	Station Valuation. Value of nitrogen.	Value of phosphoric acid.	Value of potash	Total Valuation.
707	Standard A Brand Seeding Down Fertilizer	11.51	1.60	5.58	1.19	3.35	10.12	6.77	1.55	$4 96	$12 05	$1 39	$18 40
709	Standard Fertilizer	14.30	2.19	6.78	2.41	2.35	11.54	9.19	2.42	6 79	15 40	2 18	24 37
708	Standard Guano	11.75	1.17	5.95	2.39	2.25	10.59	8.34	1.87	3 63	14 00	1 68	19 31
694	Stockbridge's Corn, Grain & Fodder Corn Manure	10.41	3.22	6.35	1.90	2.71	10.96	8.25	4.83	9 98	14.09	4 35	28 42
814	Stockbridge's Grass Top Dressing	8.47	4.73	1.28	4.05	7.71	13.04	5.33	5.53	14 66	11 20	4 98	30 84
813	Stockbridge's Manure for Fruit	7.60	2.83	6.91	2.38	3.30	12.59	9.29	4.38	8 77	15 95	4 67	29 39
809	Stockbridge's Manure for Beans	10.25	3.43	6.01	2.44	2.10	10.55	8.45	6.86	11 10	14 12	6 18	31 40
785	Stockbridge's Manure for Seeding Down	9.35	3.19	4.52	2.68	4.91	12.11	7.20	3.91	9 89	13 21	3 52	26 62
693	Stockbridge's Potato and Vegetable Manure.....	10.67	3.39	5.42	4.27	2.06	11.75	9.69	5.65	10 51	15 89	5 08	31 48
758	Sturtevant's Granulated Tobacco and Sulphur ...	4.77	2.35	-	-	-	.83	-	7.38	7 28	1 00	8 11	16 40
810	World of Good Raw Bone Superphosphate.......	4.59	2.14	5.85	3.30	3.48	12.63	9.15	1.85	6 63	15 70	1 66	23 99

No one who is familiar with the published list of fertilizers that are sold in several states can have failed to notice, not only that there is great multiplicity of brands, but that the names of the various mixed fertilizers indicate that they are to be used for special purposes. We have fertilizers for no special purpose, but for general use, those for corn, for potatoes, for grain, for fruit, for lawns, for top dressing, for seeding down and for various other purposes, if we may regard the names as meaning anything. It is not known to what extent farmers give attention to these names, but it is hoped that they have already learned that they are largely a trade expedient by means of which manufacturers hope to increase their sales. To be sure, potato manure usually contains more than an average amount of potash, and seeding down manures more than the ordinary percentage of insoluble phosphoric acid, but this signifies nothing when we find how slight the difference is between certain corn fertilizers and certain potato "phosphates." These fertilizers are not compounded in accordance with any well defined principle.

No facts are known with regard to the composition of soils or the nutrition of plants which warrant the use of less phosphoric acid and more of nitrogen and potash in a fertilizer for beans than in one for potatoes, as is done in one case. In fact, if we are to judge this matter of special fertilizers by the composition of these goods as we find them in the market, the whole thing appears to be farcical or a species of humbuggery. It is just as sensible to buy some corn manures for use on potatoes, and some potato manures for use on corn as it is to apply them in accordance with their names. The great and controlling factor which should determine what fertilizers are to be purchased is the needs of the soil, and each farmer should purchase manure rich in potash or poor in potash, according to the teaching of his experience.

THE QUALITY OF THE NITROGENOUS MATERIAL IN THE SUPERPHOSPHATES SOLD IN MAINE.

In 1889, this Experiment Station tested the quality of the organic nitrogenous material found in the fertilizers sold in Maine, using the only method which appears to promise fairly reliable results.

There was published in connection with the results of the work of that year an explanation of the needs and methods of such a test, part of which is reproduced in this connection.

Experiment stations have assumed that the organic nitrogen of mixed fertilizers is supplied in the best forms, and have valued it accordingly, but it has been recognized, at the same time, that some way of detecting inferior forms is extremely desirable. The method for doing this which has received most attention, is based upon the different degrees of solubility of organic nitrogen compounds in a pepsin solution. The nitrogen of dried blood, dried flesh, cottonseed meal and similar high grade nitrogenous materials, is very largely dissolved by digestion in a pepsin solution, while that of horn, hoof and leather is much less affected by this treatment.

In support of this statement, there is given below the results of experiments conducted in three different laboratories for the purpose of testing the value of this method. With regard to most of the materials used, these results are practically in accord.

SOLUBILITY OF CERTAIN NITROGENOUS MATERIALS IN PEPSIN SOLUTION.

Materials Used.	Per Cent of Total Nitrogen Dissolved as Found by		
	Shepard & Chazal.	Connecticut Experiment Station.	Maine Experiment Station.
Dried blood	99.8 78.6 } 98.2	96.8 97.9 } 97.3	97.3 93.3 97.6 95.1 } 95.8
Cottonseed meal	83.2 85.7 83.1 } 84.0	91.7	
Ground bone	....	52. to 99.* av 78	68.3
Dried flesh	93.3	78.7 85.4 77.5 } 80.5	75.7 75 4 78.4 } 76.5
Dried fish	....	58. to 72.† av. 66	
Fish scrap	88.6 84.6 } 86.6	-	59.2 82.6 } 70.9
Tankage	61.3	-	58.0 48.6 } 53.3
Wool waste	....	4.8	
Leather	37.8	25.4 35.9 33.3 } 34.9	26.5 7 7 } 17.1
Horn and hoof meal	....	7.2 22.4 28.2 } 19.3	25.6

* Twenty samples. † Seven samples.

The degree of solubility for cheap and inferior "ammoniates" such as horn, hoof, leather and wool waste is seen to vary from 4.8 per cent to 37.8 per cent. while in the case of dried blood, cottonseed meal, dried and ground flesh, dried fish, fish scrap and ground bone the average percentages of the different trials range from 70.9 per cent to 97.3 per cent.

It is shown by the Connecticut Experiment Station* that mixing with these ammoniates mineral compounds of the kind and in the quantity that would be found accompanying them in superphosphates does not materially change their solubility in a pepsin solution, consequently it is fair to conclude that the solubility in a pepsin solution of the organic nitrogen of a superphosphate will show whether this ingredient is furnished largely in an inferior form.

It was found in 1889, that the percentage of nitrogen soluble in a pepsin solution varied in the several brands tested from thirty-eight to seventy-eight per cent. This variation most certainly indicated a radical difference in the character of the ammoniates used by the various manufacturers, and it was thought wise to repeat this work with the goods offered for sale in 1891. Not every brand of which samples have been taken in the market has been submitted to this test, but there has been selected for this purpose at least one brand from each manufacturer selling goods in the State. The work was performed by Mr. Merrill with the use of the following methods:

The sample taken to represent a brand of superphosphate was made up so as to represent the average of all the samples of that brand, selected this season. This was done, for instance, in the case of the Bay State Fertilizer, by weighing out equal quantities of Nos. 755, 793 and 837, and thoroughly mixing them in a mortar. One gram of substance was thoroughly leached with water and then submitted to the action of a pepsin solution in accordance with the method given below. The insoluble nitrogen of the residue was then determined.†

The percentages of organic nitrogen given are the total nitrogen minus the nitrogen as nitric acid and ammonia. The tables which follow explain themselves.

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*Report Connecticut Experiment Station, 1885, pp. 120-121.

†The method of treating the substances was briefly as follows: The pepsin solution was made by dissolving 5 grams of scale pepsin in 1000 c. c. of .2 per cent hydrochloric acid. Two grams of the substance were digested for 12 hours on each of two consecutive days with 200 c. c. of this solution, at a temperature of 40 degrees C. During the time of digestion 2 c. c. of a ten per cent solution of hydrochloric acid were added at regular intervals until the digestive fluid contained one per cent of the acid.

Brand.	Per Cent of Nitrogen in Fertilizer. Nitrogen as nitric acid	Nitrogen as ammonia.	Organic nitrogen.	Total Nitrogen	Solubility in Pepsin Solution. Per cent of organic nitrogen soluble in pepsin in fertilizer	Per cent of organic nitrogen soluble in pepsin solution.	Per cent of total nitrogen soluble in water and pepsin solution.
Allen's Fertilizer for Lawn	–	.91	1.68	2.59	.59	35.1	57.9
Bay State Fertilizer	–	.49	2.21	2.70	1.54	69.7	75.2
Bowker's Potato Phosphate	.47	–	1.54	2.01	1.00	64.9	73.1
Bradley's Potato Manure	.37	–	2.39	2.76	1.50	62 8	67.8
Buffalo Hop, Tobacco and Potato Phosphate	–	.25	2.18	2.43	1.64	75.2	77.8
Buffalo Potato, Tobacco and Hop Phosphate	-	.26	1.87	2.13	1.12	59.9	64.8
Cumberland Bone Superphosphate.	.26	.21	1 84	2.31	1.04	56.5	65.4
Dirigo Fertilizer	-	.22	3.40	3.62	1.48	43.5	47.0
E. Frank Coe's Potato Fertilizer...	–	.70	1.54	2.24	.86	55.8	69.6
Farrar's Potato Superphosphate...	–	.43	2.13	2.56	1.42	66.7	72.3
Nobsque Guano	–	-	1.15	1.15	.62	53.9	53.9
Original Bay State Superphos ..	–	.25	2.34	2.59	1.56	66.7	69.9
Powell's Prepared Chemicals for Potatoes and Vegetables	.57	1.11	.09	1.77			
Quinnipiac Grass Fertilizer	.82	.32	2.27	3.41	1.18	52 0	68.3
Quinnipiac Phosphate	.46	.43	2.09	2.98	1.15	55.0	68.5
Quinnipiac Potato Manure	.61	.21	1.89	2.71	1.27	67.2	77.1
Sagadahoc Special Potato Fertilizer	–	1.40	1.97	3.37	.99	50.2	70.9
Sagadahoc Superphosphate for Hill and Drill	–	1.03	1.98	3.01	1.07	54.0	69.8
Standard A Brand Seeding Down..	-	.30	1.30	1.60	.81	62.3	69.4
Standard Fertilizer	–	.22	1.99	2.19	1.2	60.8	64.4
Standard Guano	–	.16	1.01	1.17	.63	62.4	67.5
Stockbridge Manure, Corn, Grain, and Fodder	1.41	–	1.81	3 22	1.20	66.3	81.1
Williams & Clark Potato Phos	.47	–	2.27	2.74	1.52	67.0	72.6
World of Good Raw Bone Superphosphate	-	-	2.14	2.14	1.68	78.5	78.5

The solubility of the organic material in various fertilizers in a pepsin solution varies from thirty-five per cent to seventy-eight per cent.

In the case of several brands, the figures are such as to cause grave doubts as to whether the manufacturers are not using what are regarded as low grade ammoniates, that is, ammoniates coming from such materials as hoof, horn, leather, &c . of which we have reason to suppose that they will decompose slowly in the soil and are therefore poorly adapted for use with quickly growing plants.

It is at least safe to affirm that with a large number of these fertilizers the solubility of the organic matter comes far short of that which dried blood, cottonseed meal, dried flesh and similar materials are known to have.

STATION EQUIPMENT.

The Maine Experiment Station, since its organization in 1885, has devoted a fair share of its income and of the time of its working force to a study of some of the practical problems pertaining to animal nutrition. During all this time the equipment for this work has been gradually improving, until it has become quite satisfactory for conducting experiments in determining the digestibility of cattle foods and in testing the economy of various methods and rations for producing meat and milk

A description of the Station Barn is given here, not because its arrangement and equipment are regarded as especially good, but because the interest of those who are following the Station work may be increased possibly by a definite understanding of just how and where this work is done.

THE STATION BARN.

This is a building (see cut) one hundred feet long by forty feet wide. It consists of a basement, the first floor, which is devoted to space for tying animals and to other necessary rooms, and the second story, which gives sufficient room for the storing of fodder and numerous lots of experimental grain. The foundation of the barn, which constitutes the walls of the basement and which rests for its entire length upon a solid ledge, is built of broken stone and is thoroughly cemented on the outside and well filled with mortar on the inside.

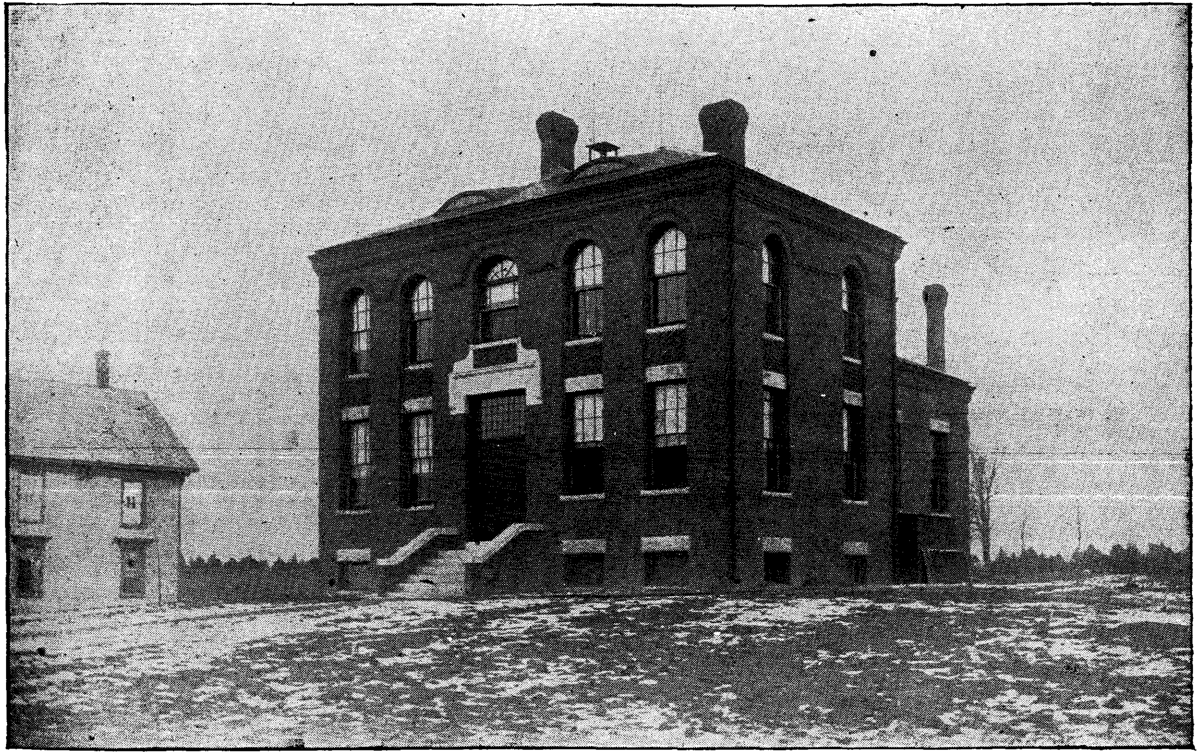
The floor of the basement consists of solid ledge covered by a small amount of earth, and has sufficient inclination to entirely prevent any standing water, even if such were to come from outside drainage, which is not the case.

The first floor of the barn is occupied as follows (see Plate I):

(0) A driveway and floor for feeding which occupies the center of the entire length of the barn. This floor space is covered by an upper floor with the exception of about twenty feet at one end.

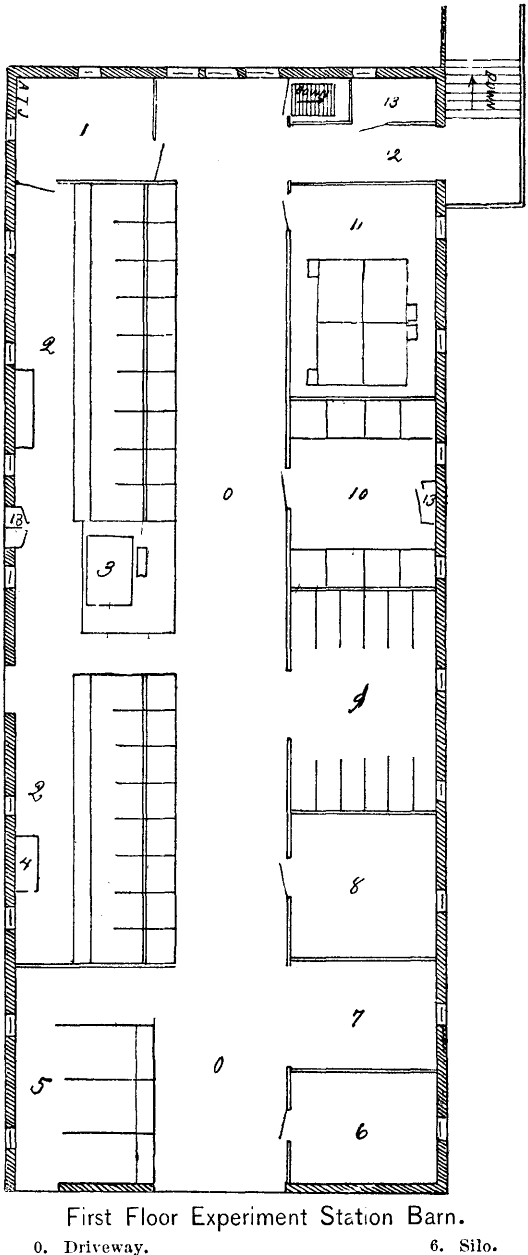
(1) A hospital in the southwest corner of the barn.

(2) A tie-up on the south side of the barn which has seventeen stalls. This tie-up is provided with scales (3) set in the floor for



MAINE EXPERIMENT STATION CHEMICAL LABORATORY AND OFFICES.

PLATE I.



First Floor Experiment Station Barn.

0. Driveway.
1. Hospital.
2. Cow Stable.
3. Scales.
4. Water.
5. Horse Stable.
6. Silo.
7. Storage.
8. Storage.
9. Hay Bins.
10. Grain Room.
11. Digestion Room.

the purpose of weighing experimental animals. It is also supplied with running water (4). The stalls are built of birch and are so constructed as to give the animal the utmost ease in its movements. (See cut). The manure drops through trap doors into the basement.

(5) Horse stalls to accommodate the horses of such station officers as live at a distance from the College buildings.

(6) The silo in the northeast corner which extends from the floor of the basement to the second floor above.

(7) Space for the storage of implements.

(8) A room for the storage of fertilizers, grains, etc.

(9) Small bins into which the hay rations of experimental animals are weighed.

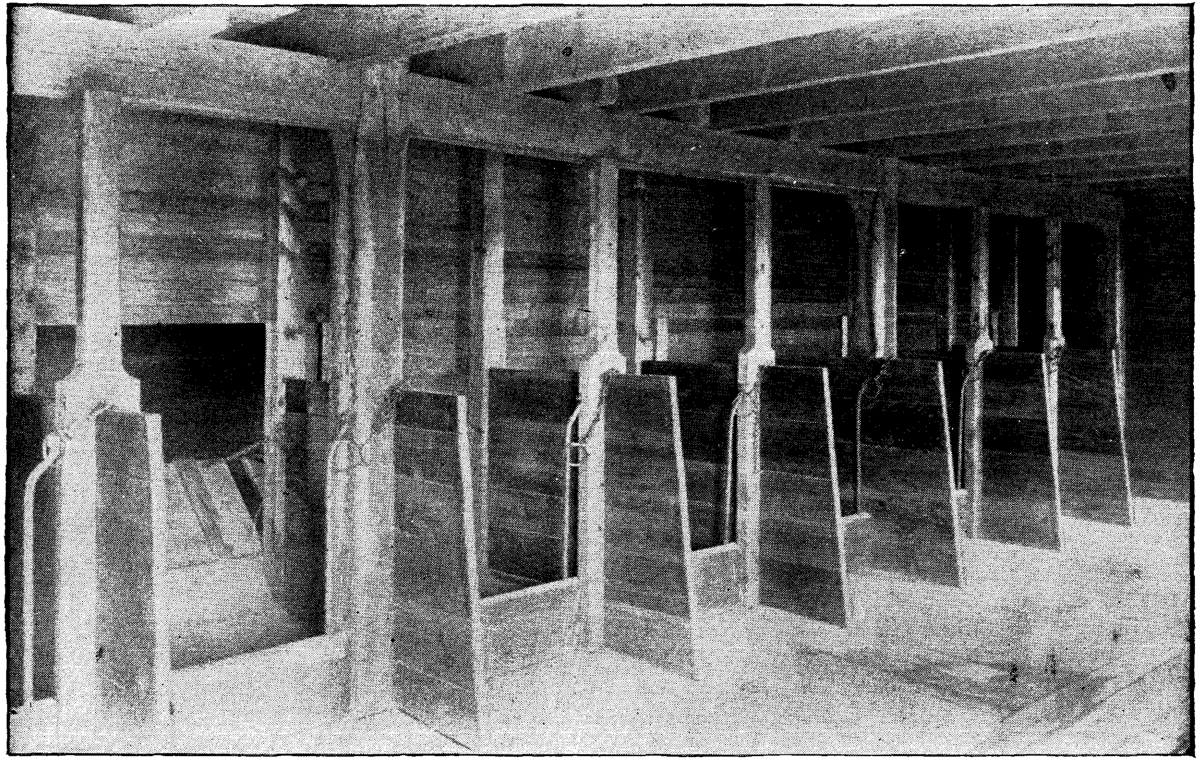
(10) The grain room, equipped with a number of grain bins and scales for the weighing of rations.

(11) A room devoted to digestion experiments.

The walls of these various rooms, as well as the partitions between them and the feeding floor consist of spruce sheathing. The use of the second floor has already been stated. The hay or grain is taken from the load (which is driven into the end of the barn that is not floored over) by a fork, which, running on a track near the ridgepole of the barn, distributes the hay to any desired point.

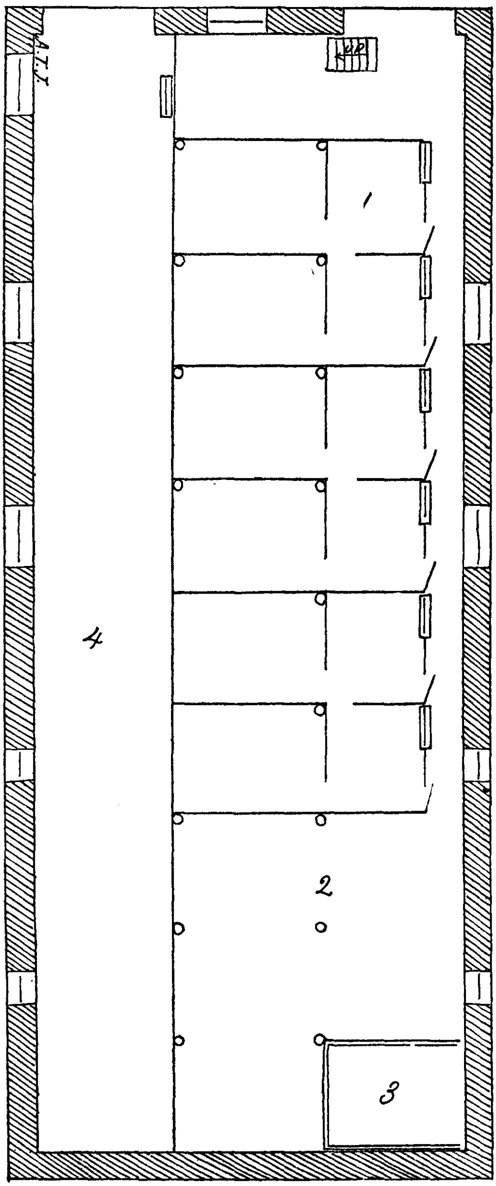
FEEDING EXPERIMENTS WITH COWS AND OTHER BOVINES.

These experiments usually involve both the feeding of a fodder and a grain ration. The fodder, if hay, is generally weighed out in lots of fifty pounds and stored in the bins provided for that purpose. Each bin is set aside to the use of a certain animal, and a cow, for instance, is fed from her particular bin until it is necessary to weigh out a new portion of hay. By adopting this method it is possible to avoid such numerous weighings as would be required if the fodder was weighed each time the animal is fed. In the grain room are found boxes which are marked with either the numbers or names of the animals, into which each portion of grain is weighed. When this grain is fed it is turned into the stalls, the bottoms of which are so constructed that there is no waste. Generally the rations, both of fodder and grain, are entirely consumed, but if such is not the case, the uneaten portions are saved and weighed, so that it is possible to calculate the



COW STALLS IN EXPERIMENT STATION BARN.

PLATE II.



Basement Experiment Station Barn.

1. Pig Pens.
2. Storage.
3. Silo.
4. Manure.

amounts actually eaten. If the experiment is with growing animals, not only is there a daily weighing of rations, but the weight of the animals must be ascertained at the beginning and end of the several feeding periods. The animals are usually weighed on several successive days and the average of these weights is taken as a basis for calculating the amount of growth.

If an experiment is being made with dairy cows, not only is it necessary to weigh the rations and also to keep a record of the weights of the cows, but the weight of each mess of milk must be recorded. The weights of milk are marked on prepared blanks which are hung in a convenient place behind the animals. In all such experiments the appetite and health of the animals are carefully watched and the results with any animal that is not in proper condition are not allowed to enter into the final published records. The experimental animals, whether young stock or dairy cows, are allowed a proper amount of exercise in a yard which lies on the sunny side of the barn. A portion of the partition which separates the tie-up from the feeding floor is hinged, so that one part can be let down and another part turned up. In this way, it is possible to give proper ventilation and to some extent, control the temperature where the animals are standing.

SWINE FEEDING EXPERIMENTS.

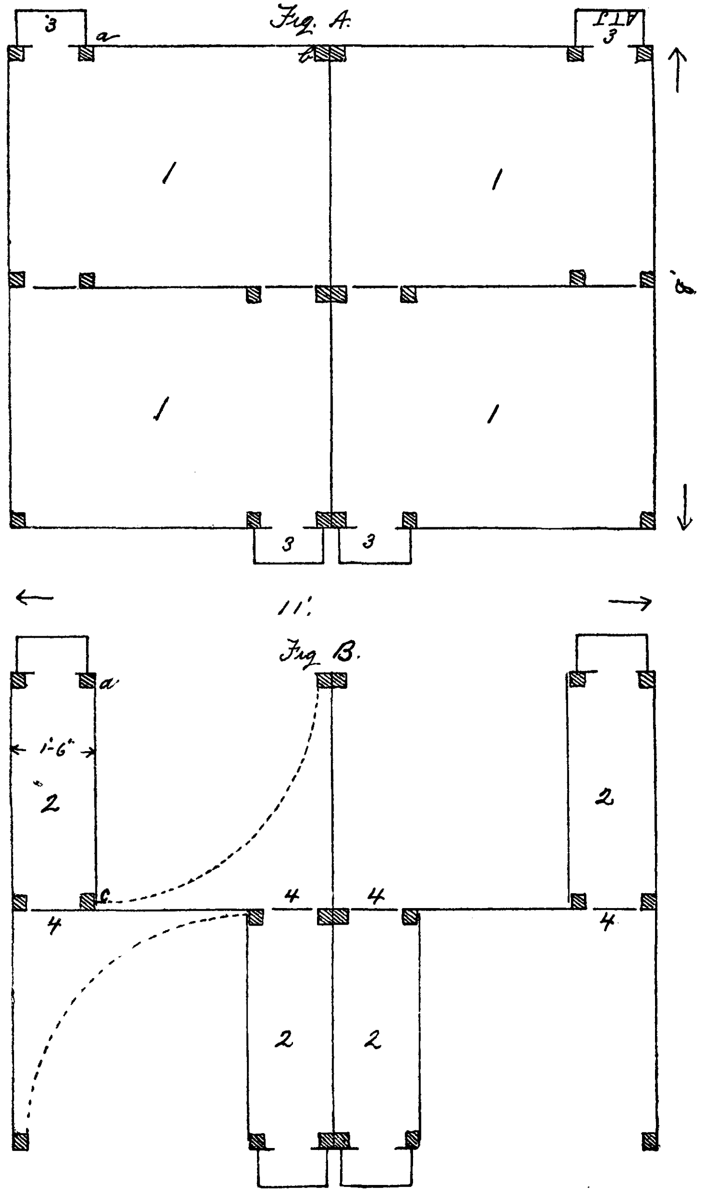
These experiments are to be carried on in the future in six pens which have lately been built in the basement (see Plate II). These pens are divided into two rooms which are connected by a sliding door, one room having a floor of spruce plank. This latter part is well littered with straw and is intended for the place where the animals shall eat and sleep. The feeding troughs are so arranged that by means of a swinging partition the animals can be excluded from them. This device prevents the troughs being filled with filth during the time when the animals are not eating, and allows the attendant to turn in the food without inconvenience. After the food is turned in, the partition is swung to the outside of the trough, and when the animal has finished his meal, is swung back again.

THE DIGESTION ROOM.

The mechanical appliances which must be considered in connection with a digestion experiment, are:

(1) The pen or stall in which the animal is kept.

PLATE III.



Pens For Digestion Experiments With Sheep.

1. Pens, with sheep at liberty.
2. Pens, with sheep confined.
3. Feeding Boxes.
4. Sliding Panels.

(2) The rubber bag and harness which are attached to the animal during the time that it is necessary to collect the excrements.

The form of the stall or pen depends upon the kind of animal used. The digestion trials made by this Station have been almost entirely with sheep, and the pen shown in the accompanying plate was devised here for use with this animal. The sides of these pens are 3'—9" high and are built of four-inch spruce sheathing, with spaces.

As can be seen by reference to Plate III, the pens are so constructed that four sheep can be used at one time. As shown in Fig. A, each pen has a floor space of twenty-two square feet.

In Fig. B nearly all of one side of each pen has been swung from the position *a b* to the position *a c*, forming a stall 18x48 inches in dimensions, in which the sheep can stand and lie at ease but cannot turn around.

It is well known to those familiar with the methods of digestion experiments that a feeding period of from twelve to fourteen days is necessary. at least the first seven days of which must be devoted to a preliminary feeding before it is safe to collect the excrement. During this first seven days the animal may have the liberty of the pen as shown in Fig. A. When, however, the excrement bags are attached it is necessary to confine the animals in the stalls as shown in Fig. B, either during the entire five days or at least while the contents of the bags are being removed.

During the last five days, while confined in the smaller pens, the animals stand upon a movable slat floor, the spaces between the slats allowing the urine to flow out of the way so that neither the animal nor the bags become soiled. The outer end of each of the small pens contains an aperture through which the animal's head has access to the feeding boxes which are attached outside. These feeding boxes are wooden boxes lined with zinc, which are extended upwards with galvanized iron to a height that entirely prevents the scattering of the food outside. The rear end of the smaller pens consists in part of a sliding panel, which allows the convenient removal of the contents of the excrement bags.

During the seven days that the dung is not collected the animals are freely bedded with dry, clean sawdust. When the bags are attached the bedding is removed and the floors thoroughly swept, so that it is possible to see whether any loss of dung has occurred.

MAINE EXPERIMENT STATION BARN.

The arrangement of these pens has so far proved entirely satisfactory, and is commended to those who desire to undertake digestion experiments.

The excrement bags in use by this Station consist on the inside of the ordinary rubber cloth which can be purchased at any drug store, and on the outside of bed ticking, which gives strength and durability. These bags are attached to the animal by means of a light harness. This harness is made as follows: A collar passes around the animal's neck, and a band around the body just back of the fore legs. To the neck collar are attached four straps which pass lengthwise of the body, two along the back and two between the fore legs. The straps slide through slots in the body band, and are attached to the bag on the back and under the belly just front of the hind legs. The lower end of the bag is not sewed together, but is closed when necessary by tying a string around it. In this way the bags can be emptied by simply untying the string and allowing the contents to drop into a dish placed underneath.

DIGESTION EXPERIMENTS.

The digestion experiments, the results of which are given in the following pages, were not wholly accomplished within the year 1891, but were in part performed during the latter part of 1890.

The materials which were made the subject of these experiments were produced on the College Farm in the summer of 1890, excepting, of course, the bran and gluten meal. The mere determination of digestion coefficients was not, in every case, the main object of the work. While a knowledge of the digestibility of these foods is of value in itself. here it was in large part essential to correct conclusions in regard to quite different questions.

EXPERIMENTAL FOODS.

The foods whose digestibility was determined were the fol'owing:

CXXI. Hungarian Grass.
CXXVIII. Hungarian Hay (cxxi dried).
CXXVII. So. Conn Fodder.
CXXV. Field Corn Fodder.
CXXVI. Sweet Corn Fodder.
CXL. Timothy Hay.
CXLI. Timothy Hay.
CXXXIII. Sugar Beets.
CXXXII. Mangolds.
CXXX. Rutabagas.
CXXXI. English Flat Turnips.
CXXXIV. Gluten Meal.
CXXXV. Wheat Bran.

The gluten meal and wheat bran were purchased in the Bangor market and the other foods were produced by the Station.

DIGESTIBILITY OF HUNGARIAN GRASS.

Time of experiment, August and September, 1890.
Animals used, Sheep.
Daily ration, 2.250 grams.
Total period, 12 days.
Feces collected, last five days.

A certain amount of the grass was cut daily, from which, after chopping, the rations were weighed. A portion of the fresh grass unchopped was also put aside each day and carefully spread for drying.

Samples for analysis were selected daily and were immediately dried in the laboratory by the aid of steam heat.

Analytical data—The composition of the fresh grass is given below, as well as that of the water-free material.

COMPOSITION OF HUNGARIAN GRASS.

	Fresh Grass.						Water-free Substance.				
	Water—per ct.	Ash—per ct.	Protein N x 6 25—per ct.	Fiber—per ct.	Nitrogen-free extract—per ct.	Fat—per ct.	Ash—per ct.	Protein N x 6.25—per ct	Fiber—per ct.	Nitrogen-free extract—per ct	Fat—per ct.
CXXI, Hungarian Grass...........	75.29	2.29	2.73	7.58	11.29	.82	9.26	11.07	30.66	45.68	3.33

COMPOSITION OF FECES FROM HUNGARIAN GRASS.

	Fresh Feces.		In 100 Parts Dry Substance.				
	Water—per ct.	Dry substance per ct	Ash.	Protein N x 625.	Fiber.	Nitrogen-free extract.	Fat.
Sheep 1........................	65.37	34.63	14.50	11.25	27.15	43.26	3.84
2........................	68.48	31.52	14.85	11.97	27.13	41.47	4.58
3........................	52.34	47.66	15.52	10.86	26.74	41.4[illegible]	4.42
4........................	54.26	45.74	14.22	11.25	26.25	43.8[illegible]	4.40

WEIGHTS OF FOOD AND FECES.

	Food Eaten Daily.		Feces Excreted Daily.	
	Green—grams.	Water free—grams	Fresh—grams.	Water-free—grams.
Hungarian Grass, Sheep 1........	2250	556	626	216.8
2........	2250	556	661	208.4
3	2250	556	430	205.0
4........	2250	566	400.4	183.2

The digestibility of the Hungarian Grass as calculated from the preceding data was as follows:*

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Sheep 1........... ...	61.	63.4	37.2	60.2	65.4	63.5	54.9
Sheep 2..	62.5	65.1	37.	59.4	66 8	66.7	47.8
Sheep 3..............	63.1	65.2	42.5	63.6	67.2	64.8	50.5
Sheep 4..............	67.	68.8	49.5	66.4	71.7	68.4	56.
Average	63.4	65.6	41.5	62.4	67.8	65.8	52.3

DIGESTIBILITY OF HUNGARIAN HAY.

Time of experiment, November, 1890.

Animals used, sheep.

Daily ration, 800 grams air dry hay.

Total period, 12 days.

Feces collected, last five days.

This hay was made from the grass used in the digestion experiment previously described; the grass was dried under cover by spreading it thinly on a scaffold.

Analytical Data.—The tables below give the composition of the hay and feces and the weights of materials.

* Tables showing the necessary calculations for these and other coefficients can be found in the appendix to this part of the report.

COMPOSITION OF HUNGARIAN HAY.

	Air-Dry Hay.						Water-free Substance.				
	Water.	Ash.	Protein N x 6.25.	Fiber.	Nitrogen-free extract.	Fat.	Ash.	Protein N x 6.25.	Fiber.	Nitrogen-free extract.	Fat.
CXXVIII Hungarian Hay	18.07	7.08	8.86	23.96	38.93	3.10	8.64	10 82	29.24	47.52	3.78

COMPOSITION OF FECES FROM HUNGARIAN HAY.

	Fresh Feces.		In One Hundred Parts Dry Substance				
	Water.	Dry substance.	Ash.	Protein N x 6.25	Fiber.	Nitrogen-free extract.	Fat.
Hungarian Hay, Sheep 1	53.29	46.71	12.89	12.42	26.54	44.24	3.90
Hungarian Hay, Sheep 3	51.23	48.77	12.87	12.11	27.11	44.08	3.83

WEIGHTS OF FOOD AND FECES.

	Food Eaten Daily.		Feces Excreted Daily.	
	Air-dry.	Water-free.	Fresh.	Water-free.
Hungarian Hay, Sheep 1..............	800	655.5	490	228.9
Hungarian Hay, Sheep 3..............	800	655.5	480	234.1

The following coefficients of digestibility were obtained with two sheep :

DIGESTIBILITY OF HUNGARIAN HAY.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Sheep 1.............	65.8	66.8	47.9	59.9	68.5	67.4	63.9
Sheep 3	64.3	65.9	46.9	60.	66.8	66.9	63.8
Average.........	65.	66 3	47.4	60.	67.6	67.1	63.8
Hungarian Grass as previously found,	63.4	65.6	35.5	62.4	67.8	65.8	52.3

DIGESTIBILITY OF CORN FODDER FROM SO. CORN, FIELD CORN AND SWEET CORN.

Time of experiment, October and November, 1890.

Animals used, sheep.

Total period, 12 days.

Feces collected, last 5 days.

A determination of the digestibility of the fodders from these varieties of corn was one of the necessary steps in an attempt* to study their relative yield of digestible material.

Several hundred pounds of the green fodder corn were selected from each variety at the time the crop was cut and weighed. These small lots were stored in such a manner that they would dry without moulding and where they were safe from the depredations of mice.

The partially dried fodder of the several kinds was finely chopped, thoroughly mixed, the daily rations weighed out, and samples at once taken to the laboratory, where the drying was completed by steam heat.

Analytical data.

*The details of this experiment are given on subsequent pages.

COMPOSITION OF THE CORN FODDERS BEFORE DRYING.

	Green Corn						Water-free Substance.				
	Water.	Ash.	Protein N x 6.25	Fiber.	Nitrogen-free extract	Fat.	Ash.	Protein N x 6.25	Fiber.	Nitrogen-free extract.	Fat.
CXXVII, Southern Corn..	85.06	1.28	1.64	4.58	7.00	.44	8.55	10.99	30.66	46.87	2.92
CXXV, Field Corn.......	84.21	1.20	1.77	4.01	8.28	.53	7.62	11.20	25.42	52.45	3.31
CXXVI, Sweet Corn.....	83.85	1.13	2.18	4.14	8.08	.62	7.01	13.52	25.63	49.98	3.86

COMPOSITION OF FECES FROM THE CORN FODDERS.

	Fresh Feces.		In 100 Parts Dry Substance.				
	Water.	Dry substance.	Ash.	Protein N x 6.25	Fiber.	Nitrogen-free extract.	Fat.
Southern Corn Fodder, Sheep 2.. ...	60.62	39.38	12.00	12.42	25.87	46.81	2.76
4......	53.67	46.33	11.78	12.41	25.76	47.23	2.83
Field Corn Fodder, Sheep 1.........	59.90	40.10	11.78	14.08	21.36	49.48	3.30
3.........	65.81	34.19	12.58	15.01	20.80	48.26	3.35
Sweet Corn Fodder, Sheep 2.........	72.01	27.99	14.42	17.52	19.34	46.04	2.68
4...............	69.29	30.71	13.77	16.58	20.19	46.11	3.35

WEIGHTS OF FOOD AND FECES.

	Food Eaten Daily.		Feces Excreted Daily.	
	Green.	Water-free	Fresh.	Water-free.
Southern Corn, Sheep 2......	3378.8	504.7	380.0	149.6
4.....	3378.8	504.7	342.0	158.4
Field Corn, Sheep 1..........	2553.2	403.2	283.4	113.6
3....	2553.2	403.2	360.0	123.1
Sweet Corn, Sheep 2.........	2521.0	407.2	445.2	124.7
4.......	2521.0	407.2	394.0	121.0

Below are given the coefficients of digestibility as found:

DIGESTION COEFFICIENTS OF CORN FODDERS.

	Dry substance.	Organic matter.	Ash.	Protein N x 6 25	Fiber.	Nitrogen-free extract.	Fat.
Southern Corn, Sheep 2	70.3	71.4	58.2	66.1	74.9	70.4	72.3
4	68.6	69.8	56.6	64.7	73.6	68.7	69.6
Average	69.4	70.6	57.4	65.4	74.2	69.5	70.9
Field Corn, Sheep 1	71.8	73.7	56.3	64.6	76.3	73.4	71.4
3	69.4	71.1	49.5	59.0	75 0	71.9	69.1
Average	70.6	72.4	52.9	61.8	75.6	72.6	70.2
Sweet Corn, Sheep 2	69.3	73.2	37.0	60.2	76.9	71.8	78.3
4	70.2	73.9	41.9	63.5	76.6	72.5	74.5
Average	69.7	73.5	39.4	61.8	76.7	72.1	76.4

DIGESTIBILITY OF TIMOTHY HAY.

Time of experiment, December, 1890, and February, 1891.
Animals, sheep.
Daily rations, 700 grs.
Total period, 12 days.
Feces collected, last five days.

Two large lots of hay were taken from the mows, finely chopped and thoroughly mixed. The digestibility of this material was ascertained as work necessarily preliminary to a determination of the digestibility of various roots, wheat bran and gluten meal. The hay was very nearly all Timothy, a slight mixture of other grasses being present.

Analytical data.

COMPOSITION OF TIMOTHY HAY.

	Air Dry Hay.						Water-free Substance.				
	Water.	Ash.	Protein N x 6.25	Fiber.	Nitrogen-free extract.	Fat.	Ash	Protein N x 6.25	Fiber.	Nitrogen free extract.	Fat.
CXL, Timothy Hay	7.63	4.61	6.88	30.15	46.33	4.40	4.99	7.44	32.61	50.17	4.76
CXLI, Timothy Hay	7.63	5.22	6.69	30.34	46.32	3.80	5.65	7.24	32.84	50.16	4.11

COMPOSITION OF FECES FROM TIMOTHY HAY.

	Fresh Feces.		In One Hundred Parts Dry Substance.				
	Water.	Dry substance.	Ash.	Protein N x 6.25.	Fiber	Nitrogen-free extract.	Fat.
Timothy Hay, CXL, Sheep 1.....	70.10	29.90	9.01	10.53	36.48	41.19	2.79
Sheep 2......	54.27	45.73	7.85	9.51	37.53	41.95	3.16
Sheep 3......	64.26	35.74	8.45	9.87	34.42	44.17	3.11
Sheep 4......	60.43	39.57	8.69	10.25	29.03	49.19	2.84
Timothy Hay, CXLI, Sheep 1......	63.46	36.54	8.56	9.34	36.19	43.26	2.65
Sheep 2.....	69.00	31.00	8.77	9.95	37.02	41.33	2.93
Sheep 3......	56.41	43.59	7.93	8.76	36.13	44.03	3.15
Sheep 4......	47.55	52.45	8.09	9.17	35.29	43.89	3.56

FOOD EATEN AND FECES EXCRETED.

	Food Eaten Daily.		Feces Excreted Daily.	
	Air-dry.	Water-free.	Fresh.	Water-free.
Timothy Hay, CXL, Sheep 1...........	700	646.6	891.2	266.5
Sheep 2...........	700	646.6	620.	283.5
Sheep 3...........	700	646.6	680.	243.0
Sheep 4...........	700	646.6	700.	277.
Timothy Hay, CXLI, Sheep 1...........	700	646.6	752.	274.8
Sheep 2...........	700	646.6	861.	266.9
Sheep 3...........	700	646.6	614.	267.7
Sheep 4...........	647	594.6	438.	229.7

DIGESTIBILITY OF TIMOTHY HAY.

	Dry matter.	Organic substance.	Ash.	Protein N x 6 25.	Fiber.	Nitrogen-free extract.	Fat.
Timothy Hay, CXL, Sheep 1	58.7	60.5	25.7	41.9	53.9	66.1	75.9
Sheep 2	56.1	57.4	30.9	44.0	49.[illegible]	63.3	71.1
Sheep 3.......	62.4	63.7	36.5	49.8	60.3	66.9	75.6
Sheep 4.......	57.1	58.8	25.4	40.9	61.9	58.0	74.6
Average....................	58.5	60.1	29.[illegible]	44.1	56.4	63.6	74.3
Timothy Hay, CXLI, Sheep 1	57.5	58.8	35.[illegible]	45.3	53.1	63.3	72.5
Sheep 2.....	58.7	60.0	35.9	43.3	53.5	65.9	70.7
Sheep 3......	58 6	59 6	41.9	49.8	54.5	63.7	69.2
Sheep 4	61.3	62.3	45.6	51.9	58.3	66.	67.0
Average....................	59.1	60.2	39.7	47.5	54.8	64.7	69.8

DIGESTIBILITY OF VARIOUS ROOTS.

Date of the experiment, January, 1891.

Animals used, sheep.

Daily ration, { 500 grams Timothy Hay (CXL). 2000 grams Roots.

Total period, 12 days.

Feces collected, last five days.

The digestibility of roots with ruminants cannot be determined by feeding a ration composed of them alone. It is necessary, therefore, to feed with them some fodder material like hay, straw, etc. The roots, the digestion coefficients of which have been ascertained by feeding trials during 1890 and 1891 are sugar beets, mangolds, rutabagas and English flat turnips. With these were fed a known quantity of Timothy hay (No. CXL), the digestibility of which had been previously determined. In order to test the four varieties of roots mentioned, it was necessary to employ four animals during two periods.

Analytical data.

COMPOSITION OF THE ROOTS.

	Water.	Ash.	Protein Nx 6 25.	Fiber.	Nitrogen-free extract	Fat.	Ash.	Protein Nx 6.25.	Fiber.	Nitrogen-free extract.	Fat.
CXXXIII, Sugar Beets	83.75	1.11	1.56	.85	12.57	.14	6.82	9.60	5.37	77.31	.87
CXXXII, Mangolds......	88.27	1.11	1.24	.73	8.52	.12	9.49	10.56	6.20	72.64	1.01
CXXX, Rutabagas... ...	89.05	.72	.89	1.00	7.80	.54	6.58	8.13	9.06	71.29	4.94
CXXXI, Eng. Flat Turnips	90.24	.92	1.10	1.02	6.32	.40	9.43	11.28	10.43	64.77	4.09

COMPOSITION OF FECES FROM ROOTS.

	Fresh Feces		In 100 Parts Water-free Substance.				
	Water.	Dry substance.	Ash.	Protein N x 6 25.	Fiber.	Nitrogen-free substance	Fat.
Sugar Beets, Sheep 1	61 09	38.91	13.69	10.59	32.16	40.25	3.31
3	54.93	45 07	16.22	10 32	30.34	39.65	3.47
Mangolds, Sheep 2	58.53	41.47	13.74	10.89	31.13	40.68	3.56
4	53.17	46.83	15.01	10.14	30.05	41.17	3.63
Rutabagas, Sheep 1	50.58	49.42	11.24	10.17	31 94	43.56	3.09
3	50.99	49.01	12.53	10.50	32.60	40.73	3.64
English Flat Turnips, Sheep 2	54 79	45.21	10.87	10.77	32.35	42.61	3.40
4	79.71	20.29	12.30	10.06	30.84	43.67	3.13

FOOD EATEN AND FECES EXCRETED.

		Food Eaten Daily		Feces Excreted Daily.	
		Air-dry and green.	Water-free.	Fresh.	Water-free.
Sheep 1	Timothy Hay (CXL)	500	461.8	540 8	210.4
	Sugar Beets	2000	325.0		
Sheep 3	Timothy Hay (CXD)	500	461.8	463.2	208.8
	Sugar Beets	2000	325.0		
Sheep 2	Timothy Hay (CXL)	500	461.8	591.8	245.4
	Mangolds	2000	234.6		
Sheep 4	Timothy Hay (CXL)	500	461.8	509.2	238.5
	Mangolds	2000	234.6		
Sheep 1	Timothy Hay (CXL)	500	461.8	432.0	213.5
	Rutabagas	2000	219.0		
Sheep 3	Timothy Hay (CXL)	500	461.8	460.0	225.5
	Rutabagas	2000	219.0		
Sheep 2	Timothy Hay (CXL)	500	461.8	464.0	209.8
	English Flat Turnips	2000	195.2		
Sheep 4	Timothy Hay (CXL)	500	461.8	994.0	201.6
	English Flat Turnips	2000	195.2		

DIGESTION COEFFICIENTS OF VARIOUS ROOTS.

	Dry substance.	Organic matter.	Ash	Protein N x 6.25.	Fiber.	Nitrogen-free extract.	Fat.
Sugar Beets, Sheep 1	94.2	97.6	43.2	90.0	88.5	99.8	53.5
3	94.8	99.9	20.7	92.6	113.0	100.0	46.4
Average	94.5	98.7	31.9	91.3	100.7	99.9	49.9
Mangolds, Sheep 2	77.1	82.7	21.1	69.7	26.8	90.8	
4	80.0	87.0	11.7	79.8	58.8	91.9	
Average	78.5	84.8	16.4	74.7	42.8	91.3	
Rutabagas, Sheep 1	90.0	93.0	45.8	85.9	87.5	94.4	91.6
3	84.5	89.2	16.7	74.7	61.0	95.1	76.8
Average	87.2	91.1	31.2	80.3	74.2	94.7	84.2
English Flat Turnips, Sheep 2	90.7	93.2	64.1	84.5	89.2	96.0	82.5
4	94.9	99.0	53.2	95.0	117.0	97.0	92.5
Average	92.8	96.1	58.6	89.7	103.0	96.5	97.5

DIGESTIBILITY OF GLUTEN MEAL AND WHEAT BRAN.

Time of experiment, February, 1891.

Animals used, sheep.

Daily ration, { 500 grams Timothy hay,
300 grams grain.

Total period, 12 days.

Feces collected, last five days.

There were two reasons for making digestion experiments with these two commercial cattle foods, viz: No attempt appears to have been made to learn the digestibility of gluten meal, and a former trial gave such unfavorable and somewhat unexpected results with wheat bran that it was thought best to carry through another experiment to test the correctness of the previous figures. In fact roller bran differs to such an extent from that with which German trials were probably made, that the single previous test by this Station is really the only one to which reference could heretofore be had that applies to such bran as the market now affords.

The gluten meal and bran were purchased in the Bangor market.

Analytical data.

COMPOSITION OF GLUTEN MEAL AND WHEAT BRAN.

	Air Dry Material.						In 100 Parts Water-free Material.				
	Water.	Ash.	Protein N x 6.25	Fiber.	Nitrogen-free extract.	Fat.	Ash	Protein N x 6 25	Fiber	Nitrogen-free extract.	Fat.
CXXXIV, Gluten Meal	10.20	1.00	30.81	.98	47.22	9.79	1.11	34 30	1.09	52.60	10.90
CXXXV, Wheat Bran.	11.73	6.00	15.50	9.66	52.01	5.10	6.79	17.56	10.94	58.93	5.78

COMPOSITION OF FECES FROM GLUTEN MEAL AND WHEAT BRAN.

	Fresh Feces		In 100 Parts Water-free Substance.				
	Water.	Dry substance.	Ash.	Protein N x 6.25.	Fiber.	Nitrogen-free extract.	Fat.
Gluten Meal, Sheep 2	63.82	36.18	8.91	11.57	32.36	42.81	4.35
4	77.90	22.10	9.65	16.36	27.80	41.98	4.21
Wheat Bran, Sheep 1	62.89	37.11	10.65	9.15	29.94	45.98	4.28
3	70.42	29.58	11.72	8.46	29.11	47.27	3.44

FOOD EATEN AND FECES EXCRETED.

		Food Eaten Daily		Feces Excreted Daily.	
		Air-dry.	Water-free.	Fresh.	Water-free.
Seeep 2	Timothy Hay	500	461.8	636.4	230.2
	Gluten Meal	300	269.4		
Sheep 4	Timothy Hay	500	413.5	884.0	195.4
	Gluten Meal	300	269.4		
Sheep 1	Timothy Hay	500	461.8	756.4	280.7
	Wheat Bran	300	264.8		
Sheep 3	Timothy Hay	500	461.8	1046.8	309.6
	Wheat Bran	300	264.8		

DIGESTION COEFFICIENTS FOR GLUTEN MEAL AND WHEAT BRAN.

	Dry substance.	Organic matter.	Ash.	Protein Nx 6.25.	Fiber.	Nitrogen-free extract.	Fat.
Gluten Meal, Sheep 2	81.7	86.3	-	90.2	-	88.2	85.6
4	90.2	91.9	-	83.0	33.4	93.5	90.1
Average	87.4	89.1	-	86.6		90.8	87.8
Wheat Bran, Sheep 1	65.3	68.5	-	82.7	46.9	69.6	59.5
3	54.4	59.5		81.5	25.5	58.6	68.6
Average	59.8	64.0	-	82.1	36.2	64.1	64.0
Results of previous trials*	58.8	62.8	-	73.7	-	67.5	82.6

* See Report Maine Experiment Station, 1889, p. 61.

SUMMARY OF DIGESTION COEFFICIENTS.

	Dry substance.	Organic matter.	Ash.	Protein Nx 6.25.	Fiber.	Nitrogen-free extract.	Fat.
Hungarian Grass	63.4	65.6	35.5	62.4	67.8	65.8	52.3
Hungarian Hay	65.0	66.3	47.4	60.0	67.6	67.1	63.8
Southern Corn Fodder	69.4	70.6	57.4	65.4	74.2	69.5	70.9
Field Corn Fodder	70.6	72.4	52.9	61.8	75.6	72.6	70.2
Sweet Corn Fodder	69.7	73.5	39.4	61.8	76.7	72.1	76.4
Timothy Hay	58.5	60.1	29.6	44.1	56.4	63.6	74.3
Timothy Hay	59.1	60.2	39.7	47.5	54.8	64.7	69.8
Sugar Beets	94.5	98.7	31.9	91.3	100.7	99.9	49.9
Mangolds	78.5	84.8	16.4	74.7	42.8	91.3	
Rutabagas	87.2	91.1	31.2	80.3	74.2	94.7	84.2
English Flat Turnips	92.8	96.1	58.6	89.7	103.0	96.5	97.5
Gluten Meal	87.4	89.1	-	86.6	-	90.8	87.8
Wheat Bran	59.8	64.0	-	82.1	36.2	64.1	64.0

(1) The Hungarian Grass, both when fed green and after drying, proved to be more digestible than the average of other grasses —notably more so than Timothy.

(2) The drying of the Hungarian Grass into hay did not diminish its digestibility. This is in accordance with all former experience.

(3) The corn plant as cut for the silo is one of the most digestible of fodder plants, rating in these experiments as compared with Timothy as 100:120. Sixty per cent of the dry organic matter of Timothy was digested, while with the various corn fodders the average was seventy-two per cent.

The experiments of this year disclose no especial differences in the digestibility of the Southern, Field and Sweet Corn fodders.

(4) The digestion trials with roots show them to be the most digestible of any of the foods tested, the amount of waste material being very small, averaging not over 8 per cent of the whole.

(5) The Gluten Meal, which is a waste product in the manufacture of glucose from corn, was digested to the extent of 89 per cent of its dry organic matter, which does not differ at all from the figures given in the German tables for the entire grain. The treatment which the grain receives in converting the starch into glucose does not seem to affect the digestibility of the refuse.

(6) The second trial of the digestibility of American wheat bran gives average figures almost similar to those obtained in the first trial, and shows this cattle food to be but slightly if any more digestible than good hay and much inferior in this respect to grains such as maize, oats, barley, etc.

THE PRODUCTION OF FOOD MATERIAL BY VARIOUS FODDER AND ROOT CROPS.

The list of cattle foods which many successful dairymen seem to regard as necessary for winter production of milk includes some green material. This material is furnished either from the silo or by some one of the various root crops, undoubtedly more largely from the former than from the latter at the present time. Ensilage is made almost wholly, at least in this State, from the corn plant, and in regard to the most desirable variety of corn for this purpose there seems to exist quite a difference of opinion. The roots most generally grown for winter feeding are mangolds, sugar beets, ruta-bagas and English field turnips. The inquiry of the farmer is, which of these crops is the most profitable? "Shall I produce the large varieties of Dent corn, such as the Virginia White Horse Tooth, or shall I depend upon the varieties of Flint corn and Sweet corn which make much smaller growth, but which come more nearly to maturity in this climate? Or is it better to adhere to the former practice and produce sufficient roots of some kind to furnish the needed change of food?" In attempting to study this question, in order to give the farmer helpful information, we must first decide what is the proper standard for judging the profitableness of a crop. Two factors must be considered, (1) the amount of food material produced and (2) its cost. With the latter factor the Experiment Station does not propose to deal in this connection. In regard to the former factor, we must ask: How shall we judge with regard to the production of food material? It is very evident that we cannot take as our standard the total weight of the crop, for the reason that there is so large variation of the amount of water in the various crops which have been mentioned. This water is worth no more than that which the animal takes from the trough. But shall we use the total dry matter as a measure of profitable production, excluding the question of cost? This would certainly be more accurate than to judge from the total weight of the crop, but it is evident that there would still be an inaccuracy from the fact that the dry matter of the various fodder plants varies greatly in digestibility. We must conclude then that the proper standard by means of which to compare the production of food material by various crops *is the amount of digestible dry material.* One other factor enters which it is necessary to consider to some extent, and that is the relative value of equal amounts of digestible material from different crops. For instance, the large varieties of Dent corn do not mature in this climate, but must usually be cut and put in the silo before the formation of the ear, while with our early varieties of field and sweet corn, the plant can generally be fully matured. The question arises, Is a pound of digestible material in the immature large variety equal in value to a pound of digestible material from the smaller and maturer sort?

The Maine Experiment Station has addressed itself to the study of the problems suggested above. Work in this direction was begun in the summer of 1888 and has been continued through three seasons.

In 1889 the experiment was confined to three varieties of the corn plant (see Rep. Me. Exp't Station 1889, p. 46), but in 1890 and 1891 root crops and other varieties of fodder crops were included.

The general plan followed has been to select soil uniform in quality and in previous treatment, producing upon it equal areas of the several crops under like conditions of manuring, cultivation, etc. A record has been made of the weight of each crop, and its composition, and in part its digestibility, have been determined. The following is a description of the soil and of the method of manuring, planting and cultivation for the several seasons:

1888.—Soil, clayey loam. Land in grass for several years previous. Sod broken in spring, and 600 lbs. superphosphate drilled in with seed. Seed drilled in with Eclipse corn planter. Three varieties of corn were planted on two acres. This area was divided into twelve plots, four plots being used for each variety.

1890.—Soil, clayey loam. In cultivation for four previous years. About seven cords per acre of good manure from barn cellar applied the previous autumn. Seed planted by hand. Size of plots one-twentieth of an acre, two plots being devoted to each variety of crop. The corn and root crops were thinned during cultivation to a uniform distance of plants.

1891 —Soil, clayey loam. Land in grass since 1885. Sod broken in spring and about six cords of manure from cow stable applied per acre. 240 lbs. per acre of a fertilizer consisting of 100 lbs. dissolved bone black, 100 lbs. nitrate of soda and 40 lbs. muriate of potash were sowed in the drill before the seed was planted. Manner of seeding and cultivation the same as in 1890.

The varieties of corn, roots, etc., which have been grown are the following:

Southern Corn,—White Horse Tooth.

Field Corn,—a Flint variety maturing in Penobscot Co.

Sweet Corn,—Early Crosby.

Sugar Beets,—Lane's Imperial.

Mangolds,—Champion Yellow Globe.

Rutabagas,—Yellow Globe.

English Flat Turnip,—Purple Top Strap Leaf.

Peas,—Black Eyed Marrowfat.

Hungarian Grass.

The Hungarian grass was not grown on the same land as the other crops, but the yield of this fodder plant was determined by weighing the produce from a crop fed to the College herd.

In 1888 the corn was planted with a seed drill as before stated, and when hoed the first time it was thinned as nearly as possible to two stalks per foot. About the same number of stalks were grown with each variety. In both 1890 and 1891 two stalks were grown to a foot with the Southern Corn and one stalk to a foot with the Common Field Corn and Sweet Corn. This degree of thickness with the several varieties was adopted because of the results of an investigation made by the Connecticut Experiment Station in the summer of 1888. (See Report of Conn. Exp't Station, 1889, Part 1, pages 9 to 43.) This investigation showed that the maximum amount of dry matter was produced when the variety of Dent corn used was grown with two stalks to the foot and the Flint variety with one stalk to the foot. Of course the conditions of growth are different in Connecticut from what they are in Maine, and it is possible that a similar investigation made at this Station would show that a different thickness of planting should be adopted in order to obtain maximum production. No better guide is at hand, however, than the outcome of the experiment mentioned.

In the case of the root crops the plants were thinned to the distance of one foot in a row in all of the three seasons. The peas were sown in drills at the rate of two bushels of seed per acre. With all of the crops the distance between the rows has been three feet.

The three varieties of corn were cut and weighed at the time the kernels of common field corn had become glazed and the sweet corn was past the canning stage. No ears had formed on the Southern corn. The roots were left in the ground as long as possible.

PRODUCTION BY SEVERAL VARIETIES OF FODDER AND ROOT CROPS.

		Total crop as harvested, per acre, pounds.	Per cent dry matter in grain crop.	Yield of dry matter per acre, lbs.	Per cent of dry matter digestible	Yield of digestible dry matter per acre, pounds.
Southern Corn	1888	26,295	12.30	3234.3	65.0	2102.3
	1890	32,950	14.91	4922.7	69.0	3396.7
	1891	46,340	13.46	6237.4	*69.0	4303.8
	Average for all	35,195	13.57	4798.1	-	3267.4
	Average for 1890 and 1891	39,645	-	5580.0	-	3850.0
Field Corn (Flint)	1888	14,212	17.4	2472.9	70.0	1720.5
	1890	15,300	15.84	2415.9	71.0	1715.3
	1891	28,080	13.55	3804.8	*71.0	2701.4
	Average for all	19,197	15.60	2892.8	-	2045.7
	Average for 1890 and 1891	21,690	-	3110.0	-	2208.0
Sweet Corn	1888	14,205	13.5	1917.6	61.0	1169.7
	1890	13,300	16.15	2147.9	70.0	1503.5
	1891	23,220	13.76	3195.0	*70.0	2236.5
	Average for all	16,908	14.47	2420.1	-	1636.5
	Average for 1890 and 1891	18,260	-	2671.0	-	1870.0
Mangolds	1890	18,400	11.73	2158.3	78.5	1694 3
	1891	12,350	8.65	1068.0	*78.5	838.4
	Average	15,375	10.19	1613.1	-	1266.0
Sugar Beets	1890	14,350	16.25	2331.9	94 5	2203 6
	1891	20,940	13.60	2847.8	*94.5	2691.2
	Average	17,645	14.92	2589 9	-	2447 4
Rutabagas	1890	31,550	10.95	3454.7	87.2	3012.5
	1891	31,840	10.60	3375.0	*87.2	2943.0
	Average	31,695	10.77	3414.8	-	2977.7
Eng. Flat Turnips	1890	32,350	9.76	3157.4	92.8	2930.0
	1891	24,650	7.96	1962.1	*92.8	1820.7
	Average	28,500	8.86	2559.7	-	2375.0
Hungarian Grass, 1890		18,940	24.71	4680.0	63.4	2967.0
Peas (total crop)	1890	3,522	-	-	-	-
	1891	5,329	-	-	-	-
	Average	4,425.5	-	-	-	-
Peas (grain)	1890	1,850	85.00	1572.0	87.00	1367.6
	1891	1,481	-	1258.8	87.09	1095.1
	Average	1,665.5	-	1415.4	-	1231.3
Timothy Hay (assumed crop)		4,000 0	87.50	3500.0	-	-

* Assumed to have the same digestibility as crops of previous year.

SUMMARY OF AVERAGE RESULTS FOR 1890 AND 1891.

	Yield per acre of crop as harvested.	Yield per acre of dry matter.	Yield per acre of digestible dry matter.
	Pounds.	Pounds.	Pounds.
Southern Corn	39,645	5,580	3,850
Rutabagas	31,695	3,415	2,978
Hungarian Grass	18,940	4,680	2,967
Sugar Beets	17,645	2,590	2,417
English Flat Turnips	28,500	2,559	2,375
Field Corn (Flint)	21,690	3,110	2,208
Sweet Corn	18,260	2,671	1,870
Mangolds	15,375	1,613	1,266
Peas (Grain)	1,665	1,415	1,231
Timothy Hay (assumed crop)	4,000	3,500	2,065

In discussing the above figures which are a statement of the yield of the several crops under consideration, it should be remembered that no effort was made to secure phenomenally large production. It is not claimed that in any case a maximum crop was harvested, although the growth in 1891 of twenty-three tons of So. Corn and fourteen tons of Field Corn per acre, is a fairly creditable showing. The sole purpose of these experiments has been to test the *relative* growth of these fodder and root plants, under conditions as entirely similar as it was possible to make them.

The results here given are not considered as final. Plans are in progress for repeating this work in other sections of the State on typical corn land, under conditions unquestionably favorable to a solution of the problem involved. Notwithstanding the fact that this should be considered as a report of progress, it may not be out of place to summarize the results so far reached. It should be borne in mind in this connection. that the question of cost is entirely ignored.

(1) The large variety of fodder corn, namely: the Southern White Horse Tooth, under the conditions in which the crops were grown greatly excelled the other varieties of corn and the roots in the production of total and of digestible dry matter.

(2) The crops which rank next in the production of digestible dry matter are Hungarian grass and rutabaga turnips.

Special attention is called to the very favorable comparative showing of Hungarian grass as a fodder producing crop.

(3) The common impression seems to be that our varieties of field corn and sweet corn which mature in this latitude and which are harvested for the silo after the plants have reached maturity or nearly so, contain much less water and more dry matter than the larger varieties of Southern corn. While these experiments show a difference in the percentage of dry matter in favor of the field corn and sweet corn, the difference has not proved to be as great as many would expect. The average results for three years show that the Northern field corn contained only two pounds of dry matter per hundred more than the Southern corn at the time the crops were harvested.

(4) These experiments illustrate very fully the already familiar fact that the weight of a green fodder crop is not a correct standard for judging its value. For instance, 18,940 pounds of Hungarian grass contained more than a third more dry matter than 31,695 pounds of rutabaga turnips, and practically as much dry matter as 32,000 pounds of Southern corn.

TURNIPS AS FOOD FOR SHEEP.

The relative value of different cattle foods is a matter which is very much discussed by farmers. Perhaps no foods have received more attention during the last few years than have those which are fed in a green condition such as ensilage and roots. The Experiment Station receives very many inquiries in regard to their value as compared with hay and the various grains.

Whenever these inquiries have been answered by the writer, the amount of digestible organic matter has been taken as a basis for comparison. For instance, a food containing sixty per cent of digestible organic matter has been regarded as having five times the capacity for nourishing an animal that one has containing twelve per cent, especially if the two foods are not greatly unlike in the composition of their dry matter. Experiments made by this Station go to show that the digestible matter present in food is a fairly safe standard for measuring its value. A feeding experiment which was made in the winter and spring of 1889, the purpose of which was to compare ensilage and hay, gave results which seemed to warrant the following as part of the conclusions reached. "The experiment furnished still further evidence that the amount of digestible matter present may be regarded as a safe basis for comparing the feeding value of foods of the same class." (Report Maine Experiment Station, 1889, page 75.) The comparison referred to above was made by feeding young steers. In the previous spring of 1888, a similar comparison was made, using milch cows as the experimental animals. This test showed unmistakably that a pound of digestible material coming from a mixture of hay and ensilage gave better results than a pound coming from hay alone, but the difference was not great. In summarizing this latter experiment the following statement was made: "Nevertheless, the testimony of such results as this experiment furnished sustains rather than destroys the general practical utility of the rule in making rations, that fodders have a relative value that is proportionate to their digestible material." (Report Maine Experiment Station, 1889, page 69.)

The results of a few feeding trials like these do not seem to be considered by many to be a sufficient guide for directing their practice in cattle feeding. Experience and observation have appeared to show that roots have a value which scientific investigation does not accord to them and many feeders are very slow to look any farther than commonly expressed opinion. The opinion is met in many quarters that roots are especially profitable as food for sheep. Hon. I. C. Libby of Burnham, Me., in a conversation with a member of the Station staff, advanced the idea that turnips have a value as sheep food greater than that with which they are generally credited, and greater, perhaps, than they have as food for certain other classes of animals. Later, in a letter addressed to the Director of the Station in response to certain inquiries, Mr Libby referred to the importance of sheep husbandry to Maine, and expressed the opinion that roots should be made to fill a more prominent place in the sheep ration. He also suggested that the relative value of roots would be a proper subject of investigation by the Station. In accordance with this suggestion, plans were made for conducting an experiment with sheep in the winter of 1890-91, which should have for its sole object a comparison of the value of roots and of mixed grains as fattening food. During the summer of 1890, the requisite quantity of rutabagas was produced on the College Farm, which were stored in fine condition. Early in December twenty-four good sized and perfectly healthy ewes were purchased. They were somewhat thin in flesh and were in first-rate condition for use in an experiment of this kind.

In planning this experiment it was possible to do so from either of two points of view. It is very commonly remarked when roots are made a subject of discussion, that they are especially valuable because by feeding them the animal is kept in a more healthy condition and his appetite is stimulated, so that more of other kinds of food are consumed and therefore greater growth is obtained than would otherwise be possible. This is one point of view. The other is a consideration of roots as a main supply of food outside the coarse fodder, or as a substitute for grain. Now if an experiment were to be planned to test the value of turnips because of their physiological effect in the ration, the question would be answered only by feeding one lot of sheep on dry food entirely and another lot on dry food combined with more or less roots. But if the nutritive effect of turnips as a main supplement of hay is the point to be considered, then a safe conclusion can more surely be reached by feeding some turnips to one lot of sheep and more to the other, the difference in amount of digestible material in the two cases to be made up by a larger amount of grain. In this way both lots of sheep would receive the beneficial effect upon health and appetite which green food is supposed to give, and we would be studying the single question of the relative value of roots and grain. Consequently the ration of the two lots of sheep were planned as nearly as possible so that each lot received the same amount of digestible material, the difference being that more of this material came from grain in the one case and more from turnips in the other. The feeding of the sheep was begun on December 23. The rations were as follows:

Lot 1, { 20 lbs. Hay, mostly Timothy.
12 lbs. Mixed Grain.
20 lbs. Cut Rutabagas. }

Lot 2, { 20 lbs. Hay.
7 lbs. Mixed Grain.
50 lbs Rutabagas. }

The mixed grain consisted of three parts gluten meal, two parts corn meal and one part wheat bran, by weight. This feeding period was continued until January 30. It is seen that in this period Lot 1 ate five pounds more of the mixed grain each day than Lot 2, and that Lot 2 ate thirty pounds more of turnips daily than Lot 1, or in other words, five pounds of mixed grain were against thirty pounds of turnips, it being calculated that the amount of digestible material would be about the same in the two. The animals were weighed first on December 29th and 30th, and again on January 29th and 30th. The following table shows the amount of food eaten and the gain of each lot of sheep.

FOOD AND GAIN OF SHEEP IN PERIOD 1.

	Lot 1 More Grain.	Lot 2. More Turnips.
Number of days fed	31	31
Weight of hay fed	620 pounds.	620 pounds.
Weight of mixed grain eaten	372 "	217 "
Weight of rutabagas eaten	620 "	1,550 "
Weight of sheep at end of period	1,222 "	1,124 "
Weight of sheep at beginning of period	1,125 "	1,052 "
Gain in weight	97 pounds.	72 pounds.

It appears by the above that Lot 1, receiving the more grain, gained 97 pounds, and Lot 2, receiving the more turnips, gained 71 pounds, a difference of 25 pounds. It is fair to conclude, then, that the five pounds of grain produced more increase in weight than the 30 pounds of turnips. How about the amount of digestible material in each case? At the time the experiment was begun, the amount of dry matter in the turnips was not actually known, but was assumed from previous analyses. During the time of the first feeding period the percentage of dry matter actually present in the turnips that were being fed was ascertained and it was found that the five pounds of mixed grain contained about four-tenths of a pound more of digestible material than the thirty pounds of turnips. The ration for the second period of feeding, beginning on January 30th, was changed therefore somewhat from that of the first period. The changed rations were as follows:

Lot 1, { 20 lbs. Hay.
9 lbs. Mixed Grain.
50 lbs. Rutabagas.

Lot 2, { 20 lbs. Hay.
13 lbs. Mixed Grain.
20 lbs. Rutabagas.

In this period thirty pounds of turnips were offset by only four pounds of grain. Lot 1 was fed the larger amount of turnips instead of Lot 2 as in Period 1. The feeding was continued until March 3, the animals being again weighed on each of the last two days.

Below can be seen the weight of the two lots and the amount of gain of each during the second period.

FOOD AND GAIN OF SHEEP IN PERIOD 2.

	Lot 1 More Turnips.	Lot 2. More Grain.
Number of days fed	32	32
Weight of hay fed	640 pounds	640 pounds.
Weight of mixed grain eaten	288 "	416 "
Weight of rutabagas eaten	1,600 "	640 "
Weight of sheep at end of period	1,346 "	1,262 "
Weight of sheep at beginning of period	1,222 "	1,124 "
Gain in weight	124 pounds.	138 pounds.

Gain of both lots of sheep eating more turnips	235 pounds.
Gain of both lots of sheep eating more grain	196 "
Difference in favor of ration containing more grain	39 pounds.

The results of the second feeding period still show an advantage with the sheep eating the more grain as compared with the sheep eating the more roots, although rather more digestible material was fed to the latter lot.

AMOUNT OF DIGESTIBLE MATERIAL* IN 100 POUNDS OF FOODS EATEN.

	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Timothy hay	2.95	15.75	28.69	2.69
Rutabagas†	1.23	.90	8.30	.50
Gluten meal	26.67	-	42.97	8.61
Corn meal	8.16	-	64.30	4.33
Wheat bran	12.76	3.50	33.28	3.26

POUNDS OF DIGESTIBLE MATERIAL EATEN IN 63 DAYS.

LARGER GRAIN RATION FOR 12 SHEEP.

	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Timothy hay, 1260 pounds	37.2	198.4	353.9	33.9
Rutabagas, 1260 pounds	15.5	11.3	104.6	6.3
Mixed grain, 788 pounds	143.3	4.7	381.9	49.5
Nutritive ratio, 1:6.5	196.0	214.4	840.4	89.7
LARGER TURNIP RATION FOR 12 SHEEP.				
Timothy hay, 1260 pounds	37.2	198.4	353.9	33.9
Rutabagas, 3150 pounds	38.7	28.3	261.4	15.8
Mixed grain, 505 pounds	91.8	3.0	244.7	31.7
Nutritive ratio, 1:7.7	167.7	229.7	860.0	81.4

The results of the entire experiment, covering 63 days of feeding, may be summarized as follows:

* The figures in this table are obtained from the composition and digestibility of Timothy hays Nos CXL and CXLI, gluten meal CXXXIV, and wheat bran CXXXV, as found on previous pages of this Report. The hay was estimated to have 12.5 per cent of water as fed in the barn. For the corn meal the figures of the general fodder tables were used.

† These turnips contained—water, 87 19 per cent; solids, 12.81 per cent; protein, 1.54 per cent; fiber, 1.21 per cent; N-f-ext., 8.74 per cent; fat, .59 per cent.

One-half of the sheep ate during this time 1,340 pounds of digestible material and the other half ate 1,338 pounds. The difference between the two rations was simply this: that one-half of the sheep received more of their food from roots than did the other half, the total amount of digestible material being practically the same in the two cases. One-half of the sheep ate 1,260 pounds of roots and the other half ate 3,150, the difference in the amount of dry digestible organic material in the two quantities being 206 pounds. This 206 pounds of nutrients from the roots was offset by 208 pounds of nutrients from grain, a practically equivalent quantity. Notwithstanding this equivalence in the quantity of material in the two rations, the twelve sheep receiving the more grain gained during the 63 days 39 pounds more than did the other twelve. There seems to be no reason why this test is not a fair one and it furnishes a weighty bit of evidence against the somewhat common opinion that the dry matter of roots has an especial and peculiar value beyond the small quantity which it may be wise to feed for the purpose of giving variety to the ration.

There still remains to be considered the reason why the two rations produced unlike results, even though they contained equivalent quantities of digestible material. We find by examination of the figures last given that one ration furnished to the animals considerable more digestible protein (nitrogenous compounds) than did the other, and this fact seems to be the most reasonable explanation of the difference in effect. The more nitrogenous ration produced more increase in weight. This was the ration having more grain and less rutabagas. This result is not surprising when we remember that the food of a pregnant ewe must supply material for the growth of the wool and of the fœtus, and that in both these directions the demand is very largely for protein compounds.

AN EXPERIMENT IN PRODUCING GROWTH IN LAMBS.

The object of this experiment was to present an object lesson on the profits of the liberal feeding of lambs that are intended for the market. A farmer is occasionally found who has adopted the practice of producing early lambs, which by liberal feeding can be put upon an early market at high prices. The more common practice is the production of late lambs which are grown largely on grass and are sold at the lowest prices that rule during the year. It was thought that possibly an illustration of the difference between these two methods might serve to stimulate some towards adopting the former and more profitable practice. It was found that the twenty-four ewes used in the feeding experiment with roots just described, were likely to drop their lambs during the month of April. As they were a lot of sheep quite uniform in quality, of more than average size and in good condition, because of the liberal rations which they had received, it was decided to use their lambs for this experiment. Accordingly as fast as the lambs were born, they were divided into two lots. Fortunately there were an even number of pairs of twins, so that when the division into the two lots was completed, it was found that there were ten sheep with twelve lambs in each pen.

These two lots of sheep and lambs were fed in a radically different manner. The ration of Lot 1 was intended to be an intensive ration, or a copy of the method that is used for forcing the growth of early lambs. On the other hand, Lot 2 was fed in a manner similar to that which is adopted by many farmers, who consider the sheep to be an animal that can be successfully fed on the refuse of a barn without the addition of very much grain. The sheep of Lot 1 received what good hay they would consume and a pound of grain each, per day. Besides this, the pen was so arranged that the lambs had access at all times to a supply of mixed grain. The sheep of Lot 2 were fed one-half pound grain per head daily, with what good hay they would eat. The lambs of this lot were allowed no grain excepting what they ate from the mother's ration. Until May 26th, the grain mixture consisted of three parts of gluten meal, two parts of corn meal and one part of wheat bran, by weight. After May 26th, the mixture was changed to one part of linseed meal, one part of corn meal and one part of wheat bran, by weight. Lot 1 ate 2,990 pounds of hay and 900 pounds of mixed grain. Lot 2 ate 3,010 pounds of hay and 450 pounds of mixed grain. The weight of grain eaten by the lambs of Lot 1 was 534 pounds. Besides this, both lots of sheep received two pounds per day, per head, of rutabaga turnips, until May 19th.

The following table gives the figures in detail for each sheep and lamb of both lots:

RESULTS OF EXPERIMENT IN FEEDING LAMBS.

LOT 1, LIBERAL FEEDING

Date of Birth of Lambs.	Weight of sheep after birth of lambs—lbs.	Weight of lambs at birth—lbs	Weight of fleece of sheep—lbs.	Weight of sheep when lamb three months old—lbs	Weight of lambs at three months—lbs.
March 21	97	12	5	76	51
March 28	103	8, 8 twins	6	90	40, 45
April 4	108	12	5¼	89	65
April 5	94	9	7	85	44
April 10	110	11	6¾	87	51
April 14	100	9, 9 twins	8	67	38, 38
April 15	95	9	5½	77	45
April 17	68	9	5	60	43
April 21	90	8½	5¾	80	40
April 23	102	10	4½	93	45
Total weights	967	122	58¾	804	545
	LOT 2, VERY MODERATE FEEDING.				
March 21	90	10	6	71	49
March 29	90	8, 8 twins	4¾	67	20, 20
April 2	107	12	5½	91	34
April 4	102	10	6	94	37
April 6	119	14	7	95	38
April 13	80	10	6½	70	30
April 17	98	8	6½	79	38
April 18	96	11	6	75	32
April 21	93	9	7	50	24
April 23	109	9, 9 twins	5	76	20, 22
Total weights	984	126	60¼	768	364

SUMMARY OF RESULTS.

	Lot 1 Liberal Ration.	Lot 2. Moderate Ration.
	Pounds.	Pounds.
Total hay fed in three months	2,990	3,010
Total grain eaten by sheep in three months	900	450
Total grain eaten by lambs in three months	534	
Weight of sheep after birth of lambs	967	984
Weight of fleeces taken off	59	60
Weight of sheep when lambs three months old	804	768
Loss in weight of sheep after deducting fleece	104	156
Weight of lambs at birth	122	126
Weight of lambs at age of three months	545	364
Weight of growth in three months	423	238
Average weight of lambs at birth	10.2	10.5
Average weight of lambs at three months	45.4	30.3
Largest weight of lambs from any single sheep in three mos.	95	49
Largest weight of any single lamb in three months	65	49

The second table summarizes the figures of the first. The results of this experiment are quite striking and would have been more so had the sheep been the very best quality of Shropshire grades, for instance. As it is, the object sought of illustrating the profits of high feeding of early lambs is attained. It seems that each lot of sheep lost between one and two hundred pounds in weight during the time the lambs were with them, after deducting the weights of the fleeces, Lot 2 losing fifty-two pounds more than Lot 1. The twelve lambs of Lot 1 weighed, at the end of three months, 545 pounds, and of Lot 2, 364 pounds, a difference of 181 pounds. As the weights of the lambs when born was, for Lots 1 and 2, 122 and 126 pounds, respectively; the actual growth made after birth was 423 pounds and 238 pounds, or a difference of 185 pounds. Now, to offset this greater loss of weight of fifty-two pounds on the part of the sheep and greater growth of lambs of 185 pounds, we have the cost of 984 pounds of mixed grain, this being the extra amount which was eaten by the sheep and lambs of Lot 1. We must also take into account the fact that the lambs of Lot 1 were ready for the market during the month of May, when high prices were ruling, while the lambs of Lot 2 must be grown for some time longer in the pasture and be put upon the market at very much lower prices.

A statement of the financial results of an experiment is always a difficult matter. Whatever may be the prices taken to represent the values of any product, these will be found to differ from the prices which some producers are able to obtain. The best that can be done is to assume as nearly as can be determined, the average market rates according to past experience. In the present ins'ant the case is like this: Two lots of lambs have been grown, one lot being large enough and fat enough to put upon an early market, the other lot being too small and too lean, thus requiring that they should be sent to pasture and sold on a late market. This condition of things corresponds to what may be observed in much of the practice of the State.

Lambs that are dropped in March and which are intended for the market may, by a system of high feeding, be sold at a price which is equal to at least ten cents per pound, live weight. If, however, the kind of feeding is such as still prevails to a very great extent, the lambs will of necessity go to pasture with their mothers and will be sold at a price not exceeding six cents per pound, live weight. Let us, then, apply these prices of ten cents and six cents to the lambs grown in this experiment.*

FINANCIAL RESULTS.

545 pounds lamb at 10 cents	$54 50
364 pounds lamb at 6 cents	21 84
Difference in value of lambs	32 66
Value of 52 pounds sheep at 5 cents	2 60
Increased value from liberal feeding	35 26
Value of 984 pounds extra grain at $26	12 79
Net gain from liberal feeding	$22 47
Return per ton for extra grain fed	$71 60

It appears from the above figures that the lot of sheep and lambs which were liberally fed were worth at the end of three months $35 26 more than the other lot. After deducting from this sum the cost of the 984 pounds of grain which were fed over and above that given to Lot 2, we have $22 47 as the net gain which should be credited to liberal feeding.

It seems, therefore, that the extra grain was sold to the sheep at the rate of $71 60 per ton.

*After the above was written the following note was received from Charles York, Esq., a dealer in groceries and provisions, Bangor: "I find by referring to our books for the past five years that the average price of lambs during May has been 19 cents per pound; for June, 16 cents, and for August and September, 8 to 10 cents." This illustrates the condition of the local market merely.

SUMMARY.

(1) Two lots of sheep, each containing ten sheep and twelve lambs, were feu for three months.

(2) One lot of sheep ate 3,000 pounds of hay and 1,434 of mixed grain. The other lot ate 3,000 pounds hay and 450 pounds of mixed grain. Lot 1 ate, therefore, 984 pounds more of grain than Lot 2.

(3) During the three months the sheep of Lot 1 lost 104 pounds in weight, and Lot 2, 156 pounds, a difference in favor of Lot 1, of 52 pounds. The lambs of Lot 1 weighed 545 pounds, and of Lot 2, 364 pounds, a difference in favor of Lot 1 of 181 pounds.

(4) The value of the lambs in Lot 1 was $54.50, and in Lot 2, $21.84, a difference of $32.66 in favor of liberal feeding, and a net gain above extra cost of grain of $22.47.

(5) The extra amount of grain fed to Lot 1 was sold to the sheep at the rate of $71.60 per ton.

FEEDING EXPERIMENT WITH COLTS.

An investigation of the relative value of different feeding stuffs as food for colts, involves two main considerations:

(1) The amount of growth produced.

(2) The quality of the animal.

A horse is said to have good quality when he has a well developed muscular system and exhibits that nervous activity of force which we call life or spirit. Apart from inherited tendencies, the development of *quality* depends, we may believe, partly upon the kind and quantity of food and partly upon the way the animal is handled, i. e., the exercise and training.

It would be a very difficult task to carry out experiments or investigations that would establish the relation between food and quality. It would be necessary to use more than a few animals, which should be of identical breeding, and which should be fed for several years on the rations to be compared. The writer is not aware that up to the present time such an experiment has been attempted. There exists, however, a very wide spread opinion that oats are superior to any other horse food for giving that muscular and nervous condition which so largely determines the market value of an animal.

A test of the amount of growth produced with colts by various foods is not especially difficult, at least not more so than with bovines. Two such tests have been made by this Station, one in 1890, (see Station Rep't, 1890, p. 68) and one in 1891, the results of which follow. In both instances oats have been compared with a mixture of other grain foods, such as peas and wheat middlings (1890), and gluten meal, linseed meal and middlings (1891).

The outcome of the experiment in 1890 was that oats produced less growth than an equal weight of a mixture of peas and middlings, the relation of growth being as 100 to 111. The fact that in this experiment peas were used as a part of the grain ration, a food that in the market is comparatively costly, seemed to be a good reason for repeating the experiment with commercial foods that are more common, bear a less price and are comparatively nitrogenous in character.

In this second experiment, which was made in the spring of 1891, two colts were used. No. 1 was a grade Percheron filly eleven months old, and No. 2 was a grade Percheron gelding eleven months old.

They were fed through two periods on the following rations:

Period 1,	Colt 1,	10 lbs. hay.
		6 lbs. grain mixture.
	Colt 2,	10 lbs. hay.
		5 lbs. grain mixture.
Period 2,	Colt 1,	10 lbs. hay.
		7 lbs. oats.
	Colt 2,	10 lbs. hay.
		6 lbs. oats.

The grain mixture consisted of middlings, gluten meal and Linseed meal compounded in the ratio of 60, 35 and 15. The average daily cost of the ration in Period 1 was about 12 cents, and in Period 2 about 14 cents, a difference of two cents per day for each animal.

The feeding began on March 12th, and the animals were first weighed on March 17th and 18th. Period 1 continued 43 days, and Period 2, 41 days.

The colts were tied in stalls and were given free exercise in a large yard during all pleasant weather. So far as could be determined, no unfavorable conditions entered into the experiment.

The results are stated below:

	Colt No. 1.	Colt No. 2.
Weight of colts at end of period 1	776 lbs.	652 lbs.
Weight of colts at beginning of period 1	711 lbs.	602 lbs.
Gain in weight in 43 days	65 lbs.	50 lbs.
Daily gain on mixed grains	1.51 lbs.	1.16 lbs
Weight of colts at end of period 2	794 lbs.	690 lbs
Weight of colts at beginning of period 2	776 lbs.	652 lbs.
Gain in weight in 41 days	18 lbs.	38 lbs
Daily gain on oats	.43 lbs.	.93 lbs

A glance at the above data is sufficient to show the more rapid growth on the mixed grain ration. Those who carefully consider these figures may be inclined to remark that the difference in growth caused by the two rations is too great and that some disturbing factor must have entered, thus rendering the results invalid. Certainly nothing of the kind was apparent, as before remarked.

In two tests of the relative growth produced in colts by mixed grains and oats, the greater growth was obtained in both instances from the mixed grains.

Let us return to the question of the relation of food to quality. As stated above, there seems to be a widespread opinion that oats are a superior food for horses. During the past few years the claim has been quite generally made, at least in popular literature, that this opinion has been strengthened by the supposed discovery through scientific research of the so-called *avenin*, a compound existing in the oat kernel, and said to possess properties that render it peculiarly stimulating to the nervous system. The existence of such a compound has been accepted as an easy way of explaining the peculiar effect which oats are said to have upon the spirit of a horse and in the development of the wiry, nervous Scotchman, who is addicted to his oat meal.

Has science, as in so many other instances, corroborated a belief reached through common experience? A careful study of the records relating to this question will help us to answer.

It seems that Norton, working in Johnston's laboratory, somewhere in 1845, separated what he evidently regarded as an albuminoid peculiar to the oat grain and it was named by Johnston, avenine. In 1869 Kreusler made an extended study of some of the nitrogenous compounds found in the oat kernel and his work appears to show that Johnston's avenine was very similar to legumine, and he accordingly named it oat legumine. Later, Osborne of the Connecticut Experiment Station, has made a very elaborate study of the various proteids separated from the oat grain by a number of solvents. The methods used by Osborne, owing to an advance in knowledge, were superior to those adopted by previous investigators, but did not tend to confirm the conclusions of either Norton or Kreusler. It appears to be true that notwithstanding the fact that the proteids of the oat grain have been made the subject of several very careful and elaborate investigations, using the best methods available, we have not yet any conclusive evidence that the oat kernel contains any characteristic nitrogenous compounds which may not be found in other grains. It is not difficult to see how the existence of this avenine as a substance peculiar to the oat plant has come to be accepted as a fact in popular literature, because when an error once obtains a foothold it is difficult to dislodge; but it is not so clear why this supposed compound should be credited with being a nerve stimulant. The writer is unable to find any investigation undertaken with a view to testing this matter; in fact is unable to find any data upon which such a conclusion could properly be based.

This seems to be an instance of that strange logic which so often appears in popular literature, namely: oats are a stimulating food; avenine exists in oats; therefore avenine is a stimulant. The writer is not prepared to deny that oats may have peculiar food properties that render them especially valuable as food for horses, but he believes that it should be distinctly understood that so far the only proof of this is a somewhat generally accepted opinion. It is safe to affirm also that this opinion is derived from common observation, rather than from any accurate investigations and it is just possible that it may share the fate of many other popular notions having a similar foundation. It is certainly to be considered that oats are a valuable food for horses if for no other reason because they can be fed very freely without danger of injury to health. Is it not possible that this food attained its present reputation at a time when corn was the particular food with which it was compared, and now that the markets afford such a variety of other foods equally nitrogenous or more so, can we be sure that oats are as essential as they once were to the development of a good piece of horse flesh?

The practical application of this discussion is this: Oats are a comparatively costly feeding stuff, and if they are not essential to the horse ration there would be a financial advantage in discarding their use so long as present prices hold.

THE INFLUENCE OF FOOD UPON THE QUALITY OF BUTTER.

There are many factors which determine the quality of butter, the most prominent of which is the individual character of the animal. Besides this we have the kind and condition of food, surroundings in which the animal is kept and the period of lactation. We know of the influence of these factors only in a general way. The exact relations between breed, food, surroundings and other conditions and the chemical and physical characteristics of butter are but little understood. Still more ignorant are we of the way in which certain causes produce their effects, as for instance, granting that the grade of butter may be changed by varying the food, we scarcely know anything about how this effect is produced. It is a fact that but few careful scientific investigations have been made having for their object a determination of the causes that influence the quality of butter. There has been, however, quite a material advance in recent years in our knowledge of the butter fats and in our methods of determining the physical and chemical properties of butter. This has been brought about to some extent by the study that has been necessary in finding some method of distinguishing between natural and artificial butters, and is an important step towards a better knowledge of the conditions that influence the character of butter.

The study which a butter is given in the laboratory, at the present time, involves principally the following determinations: The specific gravity, the melting point, the percentage of volatile acids and the iodine number or the amount of olein. There are other tests applied which are of less importance, perhaps. All these determinations are of value only in their relation to what we speak of as the table qualities of butter.

The influence of different foods upon butter is a subject in regard to which there are many conflicting opinions. For instance, it has been very strongly asserted by many Maine dairymen that no butter is of so high grade as that which is made when the grain ration consists of corn meal and wheat bran. On the other hand, those who are feeding the oil meals freely assert that the quality of the butter is not in any way injured. One difficulty that is in the way of an intelligent study of the effect of foods is our ignorance of the source of the butter fats. While the prevailing theory is, perhaps, that the butter fats are produced from the nitrogenous constituents of the food, there are still those who believe, and their opinions cannot be entirely gainsaid, that the fats of the food in some way directly contribute to the fats in the milk. If the fats of the food are conveyed directly into the butter, then we would expect to see a marked effect from the presence of either linseed meal or cotton seed meal in the ration, as these feeding stuffs carry a much higher percentage of fats than do others.

By the recommendation of the Station Council, this matter has been made the subject of an experiment, although similar ones have been conducted before. Five of the Station cows were fed three different kinds of rations during as many periods, the rations in the second period differing very materially from those in the first and third. An attempt was made to have this middle ration carry the smallest amount of vegetable fats that would be found in any combination of ordinary foods, while the first and third rations contained a fair proportion of cotton and linseed meal. The exact quantities and kinds of foods fed during the three periods are as follows:

Period 1—Cotton-seed meal, corn meal and wheat bran.

Period 2—Pea meal and barley meal.

Period 3—Linseed meal, corn meal and wheat bran.

KINDS AND QUANTITIES OF FOOD.

	Hay.	Cotton-seed meal.	Linseed meal	Corn meal.	Wheat bran.	Peas.	Barley.
FIRST PERIOD.							
Jansje	23.9	2	-	4	2		
Nancy	22.3	$1\frac{3}{4}$	-	$3\frac{1}{2}$	$1\frac{3}{4}$		
Queen Linda	20.6	$1\frac{3}{4}$	-	$3\frac{1}{2}$	$1\frac{3}{4}$		
Agnes	20.6	$1\frac{1}{2}$	-	3	$1\frac{1}{2}$		
Ida	20.2	$1\frac{1}{2}$	-	3	$1\frac{1}{2}$		
SECOND PERIOD (Feb. 21 to Mar. 18).							
Jansje	24.0	-	-	-	-	4	4
Nancy	22.7	-	-	-	-	$3\frac{1}{2}$	$3\frac{1}{2}$
Queen Linda	21.1	-	-	-	-	$3\frac{1}{2}$	$3\frac{1}{2}$
Agnes	20.2	-	-	-	-	3	3
Ida	20.2	-	-	-	-	3	3
THIRD PERIOD.							
Jansje	21.5	-	2	4	2		
Nancy	21.5	-	$1\frac{3}{4}$	$3\frac{1}{2}$	$1\frac{3}{4}$		
Queen Linda	20.5	-	$1\frac{3}{4}$	$3\frac{1}{2}$	$1\frac{3}{4}$		
Agnes	20.5	-	$1\frac{1}{2}$	3	$1\frac{1}{2}$		
Ida	20.5	-	$1\frac{1}{2}$	3	$1\frac{1}{2}$		

COMPOSITION OF THE FOODS.

	Water.	Ash.	Protein.	Fiber.	Nitrogen-free extract	Fats.
CXLII, cotton seed meal	9.30	6.95	44.62	5.56	23.43	10.14
CXLV, linseed meal, O. P.	9.35	5.01	36.19	7.89	33.71	7.85
CXLIII, pea meal	15.11	4.17	19.56	5.75	53.49	1.92
CXLIV, barley	14.42	6.42	9.31	10.54	54.97	4.34

YIELD OF MILK.

	Jansje—lbs	Nancy—lbs.	Queen Linda—lbs.	Agnes—lbs	Ida—lbs.	Total—lbs.
February 8th—14th	126	108	210	136	129	709
February 15th—21st	134	100	212	133	124	703
February 22d—28th.	131	100	197	133	127	688
March 1st—7th	125	89	188	115	108	625
March 8th—14th	123	94	183	118	107	625
March 15th—21st	125	99	176	116	114	630
March 22d—28th	125	99	181	125	114	644
March 29th—April 4th	128	96	179	123	110	636
April 5th—11th	119	99	172	125	106	621

COMPOSITION OF MILK.

	Total solids.	Ash.	Albuminoids.	Sugar.	Fat.
JANSJE.					
February 9th—13th, cotton seed meal mixture	13.11	.65	3.41	5.33	3.72
March 9th—13th, peas and barley	13.14	.65	3.78	4.77	3.94
April 13th—17th, linseed meal mixture	13.04	.65	3.60	5.02	3.77
NANCY.					
February 9th—13th	12.57	.65	3.46	4.67	3.79
March 9th—13th	12.40	.65	3.38	4.89	3.48
April 13th—17th	12.20	.65	3.35	4.61	3.59
QUEEN LINDA.					
February 9th—13th	12.40	.65	3.10	5.12	3.32
March 9th—13th	12.16	.65	2.89	5.34	3.28
April 13th—17th	12.04	.65	2.93	5.21	3.25
AGNES.					
February 9th—13th	14.46	.75	3.90	5.15	4.66
March 9th—13th	14.26	.75	3.94	4.78	4.79
April 13th—17th	13.84	.75	3.79	4.77	4.53
IDA.					
February 9th—13th	14.59	.75	3.80	4.74	5.30
March 9th—13th	14.23	.75	3.72	4.74	5.02
April 13th—17th	14.36	.75	3.85	4.50	5.23

POUNDS OF OTHER SOLIDS WITH EACH 100 POUNDS OF FAT.

	Jansje.	Nancy.	Queen Linda.	Agnes.	Ida.
First Period	252	232	273	210	175
Second Period	232	256	271	198	183
Third Period	246	240	270	205	174

POUNDS OF FAT FOR EACH 100 POUNDS ALBUMINOIDS.

	Jansje.	Nancy	Queen Linda.	Agnes.	Ida.
First period	109	109	107	119	137
Second period	104	103	114	122	135
Third period	105	107	111	119	136

MELTING POINTS OF BUTTER.

	Centigrade Temperature.			Fahrenheit Temperature.		
	Cotton-seed, corn meal and wheat bran.	Peas and barley.	Linseed, corn meal and wheat bran	Cotton-seed, corn meal and wheat bran.	Peas and barley.	Linseed, corn meal and wheat bran.
	°	°	°	°	°	°
Jansje—Holstein	36.3	33.6	34.2	97.2	92.5	93.6
Nancy—Ayrshire	35.	33.1	32.2	95.	91.6	90.
Queen Linda—Ayrshire	34.	32.1	33.1	93.2	89.8	91.6
Agnes—Jersey	34.2	35.1	33.6	93.6	95.2	92.5
Ida—Jersey	35.	33.9	35.2	95.	93.	95 4

VOLATILE ACIDS.

	Cotton-seed, Corn Meal and Wheat Bran.	Peas and Barley.	Linseed, Corn Meal and Wheat Bran.
Jansje—Holstein	28.7	28.7	28.3
Nancy—Ayrshire	32.3	28.9	28.7
Queen Linda—Ayrshire	32.3	30.6	30.4
Agnes—Jersey	28.8	28.2	26.2
Ida—Jersey	30.4	27.7	28.6

IODINE EQUIVALENT.

	Cotton-seed, Corn Meal and Wheat Bran.	Peas and Barley.	Linseed, Corn Meal and Wheat Bran.
Jansje—Holstein	31.5	27.3	32.
Nancy—Ayrshire	32.4	30.5	34.8
Queen Linda—Ayrshire	33.9	28.8	30.2
Agnes—Jersey	28.	23.	30.5
Ida—Jersey	26.1	25.3	25.6

The grain foods of the first period constituted the regular grain rations which the animals had been receiving for more than two years. During the entire time of these periods a record was made of the yield of milk. On five days in each period the milk was analyzed, as was also the skimmed milk from the cold setting process. The five days' cream was churned and the resulting butter was tested for the melting point, the per cent. of volatile acids and the idone equivalent or per cent. of olein. The facts that are displayed in the preceding tables show:

(1) Yield of milk.

(2) Its general composition.

(3) The relation of the fats to the albuminoids and to the other solids.

(4) The melting point of the butter fats.

(5) The relative amount of volatile acids.

(6) The iodine equivalent or amount of olein.

The results reached in this experiment are not striking, neither are they easy to explain. There was a somewhat diminished yield of milk in passing from the first to the second periods, while the composition of the milk remained unchanged or practically so throughout. Not only did the total amount of solids in the milk remain about the same with the different methods of feeding but the relation in quantity of the various solids did not change greatly, and whatever changes of this kind did occur were evidently not caused by the food.

It was remarked by both the butter maker and by the chemist who handled the butter in the laboratory, that the butter of the second period was softer than that of the first. We would, therefore, expect to find a lower melting point during the second period and this proves to be the case with the exception of one animal. With part of the animals the volatile acids changed somewhat in passing from one period to another, but these changes are evidently entirely without reference to the character of the ration. There is only one test which gives results that are significant, namely: The test for olein. It appears that the iodine equivalent is uniformly less during the second period than during the first and third, and the differences are quite marked. It is difficult to reconcile this fact with the softer appearance of the butter and the lower melting point. When the olein or liquid fat dimishes in quantity we would expect harder butter and a higher melting point.

Evidently the changes which occurred in the composition of the butter are somewhat complex and were not wholly discovered by the tests which were applied.

SUMMARY.

(1) Five cows, including one Holstein, two Ayrshires and two Jerseys, were fed three different rations during as many periods.

(2) The grain ration of the first period consisted of a mixture of cotton-seed meal, corn meal and wheat bran; during the second period, of peas and barley, and during the third period of linseed meal, corn meal and wheat bran.

(3) The amount of milk was diminished somewhat in passing from the first to the second period, and increased slightly after changing to the third period.

(4) The composition of the milk varied but little and no more, or even less, during the three periods, than is often observed when the ration is not changed.

(5) The relation in quantity in fats to the other solids varied somewhat, but apparently without reference to the food.

(6) With four of the cows the melting point of the butter was considerably lower during the second period than during the first.

(7) The relative amount of volatile acids varied only within quite narrow limits and apparently was not affected by the food.

(8) With all the cows the percentage of olein (liquid fat) was apparently considerably less during the second period, when the peas and barley were fed, than during the first and third periods.

Even though it is possible to draw only limited conclusions from this experiment, some practical suggestions appear:

(1) Quite radical changes may be made in the kind of grain ration fed, without affecting the quality of the milk.

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

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

OTHER OBSERVATIONS ON THE EFFECT OF FOOD UPON BUTTER.

Ladd, at the New York State Experiment Station (Rep. 1888, p. 291) investigated the effect of introducing linseed meal into the ration and found an increase in the iodine number and also in the viscosity. Harrington, at the Texas Experiment Station (Rep. 1889, p. 100), found that a grain ration entirely of cotton-seed meal raised the melting point of the butter and also the percentage of volatile acids. He sent samples of the same butter to Prof. Wiley of the U. S. Department of Agriculture, whose examination (see Rep. Dept. Agr. 1889, p. 181) corroborated Harrington's results and showed, moreover, that the iodine number for the cotton-seed butter was higher than for the other. A second set of samples received by Wiley from Harrington did not show such marked results. Prof. Wiley subsequently made an investigation (loc. cit. p. 184) in co-operation with the Maryland Experiment Station, and he found here that the cotton-seed caused an elevation of the melting point and a lowering of the percentage of volatile acids. The iodine number, contrary to the previous investigations, was diminished rather than increased by the feeding of cotton-seed.

An experiment conducted by the New Hampshire Experiment Station (see Bulletin No. 13) indicated that cotton-seed meal increased the hardness of the butter, that gluten meal produced a softer butter than corn meal, ensilage a softer butter than hay, and that there is a more or less definite relation between hardness and the iodine absorption number. The opinion was also expressed that the results showed no definite relation between the melting point and the hardness.

Mayer, a German chemist, has made quite an elaborate investigation (Landw. Vers. Stat. Vol. 35, p. 261) and he reached the following conclusions:

(1) The amount of volatile fatty acids in butter rises and falls with the rise and fall of the specific gravity.

(2) The melting point of butter depends more upon the amount of olein in butter than upon the amount of butyrin, capronin, etc. (compounds of the volatile acids), present.

(3) The content of volatile fatty acids in butter varies for an individual cow within wide limits.

(4) The content of volatile fatty acids in butter fat is dependent upon the period of lactation (length of time the cow has been milked) and diminishes in general with the advance of the same.

(5) The content of volatile acids is dependent to a great extent upon the food.

(6) The melting point is also influenced by the food.

The results which have been reviewed above are to quite an extent discordant and a close study of them may well be an occasion for perplexity. What appears to be true from the results of one investigator does not hold in another case. One fact, however, seems to be quite clearly indicated, which is, that the presence of cotton-seed meal in the grain ration gives to the butter a higher melting point, or in other words, increases its resistance to the effects of hot weather. It also seems that when the grain ration consists wholly, or nearly so, of cotton-seed meal, the percentage of volatile acids is considerably lowered. What effect this has on the quality of the butter is not as clear. It would not be safe, certainly, with present knowledge, to make very many assertions with regard to the specific effect of this or that food upon the composition and physical characteristics of butter.

THE BABCOCK MILK TEST ADAPTED TO TESTING CREAM.

J. M. BARTLETT.

During the past few years several simple and accurate methods for estimating fat in milk, adapted to the use of creameries and cheese factories, have been devised by different chemists. Most of these methods are very useful in testing milk and can be used for testing cream, but none of them seem to be especially adapted to the latter purpose and consequently are of no great value to creameries that collect cream only. The need of some method for determining the value of each patron's cream is now acknowledged by every one that has had much experience with creameries.

Even if the patrons of a creamery all use the cold deep setting process and are careful to keep the water at about 40° at all times, the cream from different animals or herds may vary several per cent.

Fifty samples of cream raised by this process, collected by creameries, were tested at the Connecticut Experiment Station and showed a variation of six per cent. of butter fat. One sample contained 23 8 per cent. another 17.78 per cent.

The temperature at which the milk is kept makes a very great difference in the quality of the cream. If the water in which the cans are submerged is allowed to become warm the cream will be much richer than when it is kept cold. The percentage of fat in cream from the same cows may be increased ten per cent. or more by keeping the water at 70° instead of 40°. Several samples collected by a creamery agent were tested. The lowest yield of fat was 12 per cent. and the highest 30 per cent.

The most of the samples gave from 17 per cent. to 22 per cent.

If this creamery had allowed equal amounts of butter for every inch of cream a great injustice would have been done to some of the patrons.

The writer has for the past few months devoted what limited time could be spared from other station work to studying methods with the idea of especially adopting some one for testing cream. As a result of this investigation the method devised by Dr. Babcock of the Wisconsin Experiment Station was selected, it being more simple and rapid than any that had appeared at the time of beginning this work.

Since that time the Beimling method has been brought out and by some is considered equally good, but the apparatus is a little more expensive. The Babcock method is fully explained in Bulletin No. 24 of Wisconsin Experiment Station, therefore it is only briefly described here. The milk is measured into a test bottle with a graduated neck, and about an equal amount of sulphuric acid is added, which dissolves all solids except the fat. The bottle is then at once whirled in a centrifugal machine to collect the fat on the surface of the liquid. Hot water is then added to raise the fat into the graduated part of the neck of the bottle, where the percentage can be read. The bottle used in the milk test as devised by Dr. Babcock is graduated to estimate no higher than 10 per cent. of fat, and as cream usually contains much more than that, it is evident this bottle cannot be used, if the same quantity (18 grams) is taken for the test.

To take a smaller quantity increases the liability to error and impairs the accuracy of the results. A pipette one-third the size used for milk, made to deliver about six grams of cream, was first tried, but so much care was necessary to obtain good results the idea was abandoned. In reading a long column of fat, unless one is expert and very careful to keep the temperature constant, he is liable to make an error of 0.2 or 0.3 per cent., and when only six grams of cream are used the reading must be multiplied by three, which increases the error three-fold. Dr. Babcock recommends using three bottles, dividing the pipette full into three parts, putting one-third into each bottle and adding the three readings. This method involves so much work that it would not be practical in testing a large number of samples. To overcome these difficulties the writer used a bottle like No. 2, graduated to read from 0.2 to 25 per cent. of fat, the bulb on the neck holding 10 per cent. With this bottle cream containing not more than 25 per cent. of fat can be as easily and accurately tested as milk, and as cream raised in deep cans submerged in cold water very seldom contains much over 20 per cent. these bottles are sufficiently large to answer the purpose of our creameries. Very rich cream containing over 25 per cent. fat may be diluted one half with water, or a 9c. c. pipette can be used and the readings multiplied by 2., but can be more accurately tested with a bottle like No. 3 described later on.

These test bottles can be used just as well for milk, so another set is not necessary. Bottle No. 2 cannot however be used in the regular size centrifugal machine as it is about one and one-half inches longer than the bottles used for milk testing.

A bottle of the same style, graduated to read to 23 per cent. may be used in the regular size machine.

No. 3 represents a bottle designed for testing very rich cream without reducing the quantity used for the test. Such cream, carrying over 30 per cent. fat, is frequently obtained from the separator or from milk kept at a temperature of about 60° or 70°. This bottle as is shown by the diagram is made in two pieces and is graduated to read to 35 per cent. It has some advantages over the other kinds for the reason the base is the portion most liable to breakage, and is separate from the more expensive graduated neck. One could have a large number of the bases and not require more than a dozen of the graduated necks to operate them successfully.

TESTING CREAM.

Sampling.

The first and one of the most important parts of the process is sampling the cream, for it is plain that unless this is properly done and the portion taken for the test correctly represents the whole, the results that follow must necessarily be incorrect. The lot of cream to be sampled should be put in a can or some vessel sufficiently large to hold it all, and another vessel of equal size being at hand, it should be turned alternately from one to the other four or five times to thoroughly mix and make it homogeneous. The sample must be immediately taken after the mixing is done, and put in a vessel properly labeled and suitable for the purpose. A half pint fruit jar answers the purpose well, which must be filled full to avoid churning.

How often should tests be made?

In order to be *very* accurate and ascertain exactly the amount of fat in each patron's cream, it would be necessary to take a sample from every lot collected—a definite amount, 1 oz. for every inch or quart furnished, should be taken. That is, if a patron furnishes six quarts to-day six ounces should be taken for the sample, and if he furnishes ten quarts to-morrow ten ounces should be taken for the sample.

These samples can be kept sweet in an ice chest for a week and then be thoroughly mixed together and tested. The result will accurately represent the per cent. of fat in the cream for that week. Many creameries cannot afford the time to collect samples and make tests so often, and it is not necessary if the patrons will exercise a little care to keep the water surrounding the milk cans always at the same temperature as nearly as possible. A test made once in two or three weeks will then suffice and give a sufficiently accurate basis on which to value the cream. It would be advisable to take samples for three successive days and mix them for the test. This would give a more accurate result than if only one sample was taken.

Performing the test.

With sweet cream that is not frothing, the method does not vary from that described for milk when the test bottle like No. 2 is used. A copy of these directions is furnished with each machine so a description is not necessary here. In adding hot water to the test bottles the first time, I find it most convenient to fill them to about the 20 per cent. mark, then one can easily see how much to add the second time to bring the fat where it can be measured. The measuring pipette is the same as that used for milk except it has two marks on it. The lower one (17.6) is to be used in measuring milk, the upper one (18) for measuring cream. From this latter mark the pipette delivers 18 grams of cream, raised in cans submerged in cold water, with sufficient accuracy for all practical purposes. For testing richer cream, a correction must be made because of the weight of cream delivered by the pipette decreases as the per cent. of fat increases.

For a scale reading of 25 per cent. add 0.15 per cent.; for a scale reading of 30 per cent. add 0.3 per cent. Readings between or above these may be corrected proportionately.

If the cream to be tested has become sour and curdled so it can not be handled with a pipette, it can be rendered mobile by placing the jar containing it in water and heating the whole to about 125° F., then passing the cream through fine wire gauze, (a flour sieve will do very well for the purpose.) Any lumps that remain on the sieve may be rubbed through with the finger. After passing the warm cream through the sieve two or three times, it will after cooling, be in condition to measure with the pipette. On account of the small particles of curd, sour cream adheres much more to the walls of the pipette than sweet cream, therefore a little water (4 or 5 c. c.) must be used to rinse the pipette into the test bottle. Unless this is done the results will be from 0.2 to 0 4 per cent. too low. About 20 c. c. of acid should be used when the pipette is rinsed. When the cream is frothing badly and contains a large amount of air or gas bubbles, as is sometimes the case with cream that is very sour or taken from a separator, it cannot be accurately measured but must be weighed. The writer has made several tests when the error in measuring frothy cream was over 5 per cent. of the total fat.

The only accurate method to pursue in such cases is to weigh the cream, and this can be very easily done by any one who has skill enough to make the test. A good little scale for the purpose is made by the Springer Tortion Balance Co., 92 Reade St., N. Y. Their No. 302 Handy Scale, costing about $4.00 with a weight that when put on the 8 ounce notch weighs 18 grams, is sufficiently accurate and very convenient. We would advise creameries using this test to get a scale for the purpose mentioned, for there will be instances when it will save much time and trouble. The method of using the scale is very simple. The empty test bottle is set on the pan and counterpoised by means of the ounce weight and screw at the end of the scale arm; then the 18 gram weight is put on the 8 ounce notch, the pipette filled with cream a little above the mark and emptied into the test bottle until it is nearly all in, when the finger is pressed on the top of the pipette sufficiently to allow the cream only to drop slowly till the scale turns. One can weigh with a little practice about as rapidly as he can measure. This scale will also be very convenient in testing butter and cheese, as with solids it is necessary to weigh out the portions for the test.

In using the test bottle No. 3 the method is slightly modified in the latter part of the process. The base portion, into which has been measured the cream and acid, is put in the centrifugal machine and whirled for five minutes the same as with the ordinary bottles. As much hot water is then added as the base will hold without danger of spilling, and whirled for two or three minutes more, to collect the fat on the top of the water. The base is then taken and connected with the graduated neck by a piece of rubber tubing. The whole is then put in a tank or pail of water, heated to about 110 to 120 F. and the fat raised into the neck by turning gently down the side hot dilute acid in sufficient quantity to fill the bottle to about the 34 mark. The fat usually rises and forms a compact column in two or three minutes so that by the time the 10th or 12th bottle is put into the warm water, the first can be read, giving directly the per cent. of fat.

The dilute acid consists of one part by volume of strong acid to one part of water. In mixing, the water must always be put in the vessel first and the acid turned into it. If used immediately it will need no extra heating, as sufficient heat is developed in the mixing. We have only had opportunity to make 12 or 15 tests with this bottle, but they seem to indicate that it is accurate as can be seen by the table below.

One cannot work quite as rapidly as with bottle No. 3 therefore we would advise its use only on very rich cream containing over 25 per cent. of fat.

This form of bottle (No. 3.) can be used in the regular size machine.

Where To Obtain The Apparatus.

Arrangements have been made with Cornish, Curtis & Greene, Fort Atkinson, Wis., manufacturers of the milk test apparatus, to furnish the modified apparatus to parties who may desire it at about the same price as the ordinary form.

Parties ordering the cream tester, must be particular to mention what they want or otherwise they may receive the wrong machine. Any of the pieces of glass-ware can be obtained of Emil Greiner, N. Y., and should be ordered by number, then no mistake can be made.

Cream Test bottle No. 1 is for use in the regular size milk testing machine and reads to 23 per cent.

Cream Test bottle No. 2 is for use in the machine especially made for the purpose and reads to 25 per cent.

Cream Test bottle No. 3, is for testing rich cream, can be used in either machine and reads to 35 per cent.

Sulphuric acid can be obtained of wholesale druggists, or dealers in chemicals. The Cochrane Chemical Co., Boston, Mass., sells commercial acid, specific gravity, 1.835, in carboy lots at very reasonable prices. Acid of this strength should be slightly diluted by adding about twenty parts of acid to one part of water by volume.

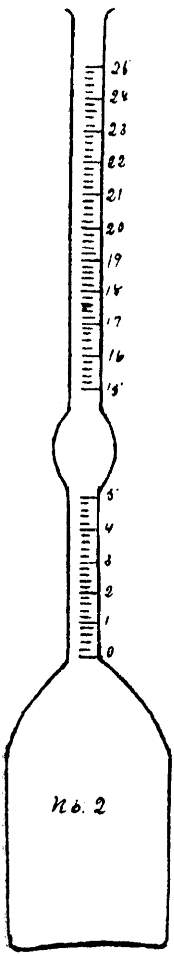
	Gravimetric Method.	Test Bottle with Bulb Neck.	Test Bottle with Separable Neck.
Cream No. 1...........	18.4	18.4	18.45
" "		18.35	18.40
" "			18.35
" "			18.40
" No. 2...........	14.3	14.1	14.0
" "	"	14.2	14.3
" "	"	14 1	
" "	"	14.3	
" No. 3...........	19.6	19.3	19.3
" "	19.7	19.3	19.5
" "	"	19.2	
" "	"	19.7	
" "	"	19.6	
" "	"	19.8	
" No. 4...........	18.62	18.4	
" No. 5...........	18.6	18.5	
" No. 6...........	20.4	20.1	20.0
" No. 7.	19.75	19.6	19.6
" "	"	19.6	19.8
" "	"	19.8	19.8
" "	"	19.9	19.9
" "	"	19 7	19.7

NOTE.—The object of this bulletin is to call attention to an accurate and rapid method of determining the percentage of fat in milk and cream. The apparatus as originally described by Dr. Babcock has been modified by Mr. Bartlett to meet the needs of creamery work in Maine and the new forms of testing flasks that have been devised are favorably regarded by Dr. Babcock. The Experiment Station does not assume that the managers of creameries are ready to value their patrons cream on the basis of the actual percentages of fat, neither does it propose at this time to urge such a course, for that is a purely business matter, but it seems very desirable that in case any creamery management should conclude to apply the only just standard of valuation, some practical method for doing this should be at hand. This bulletin presents such a method.

Should any creamery manager or private dairyman wish to purchase and put into operation the Babcock apparatus, the Experiment station will be glad to render all the assistance possible, either through suggestions about the purchase of, or instruction in the use of, the apparatus. Prompt attention will be given to all inquiries in regard to the matter.

W. H. JORDAN.
DIRECTOR.

ORONO, ME.,
Sept. 1st, 1891.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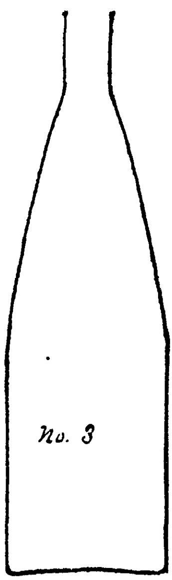
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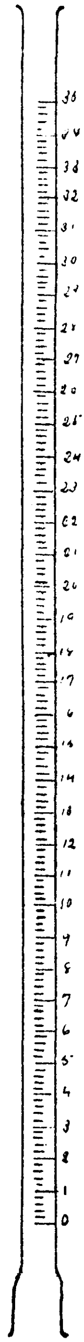


FURTHER REMARKS ON THE BABCOCK CREAM TEST.

J. M. BARTLETT.

Since Bulletin No., 3 was issued, many inquiries from parties interested in creameries have been received, and while a few creameries have already obtained and are successfully using the Babcock test, there still seems to be a grave doubt in the minds of some as to the practicability of applying a test that gives the value of the cream in butter fat instead of in butter. Again, when the cream is bought by the inch, measured in the cans as it stands on the milk, and then is sampled for the test after its volume has been increased by a small amount of skimmed milk drawn off in the skimming, the per cent. of fat obtained is too small. In regard to the first mentioned difficulty, it is unnecessary to consider the amount of butter the cream will make; nevertheless, if some insist on using the butter valuation, they will not come far from the truth if they consider that butter is 85 per cent. fat, or that 85 pounds of fat will make one hundred pounds of butter.

Cream for butter making is only valuable for the amount of butter fat it contains, and there seems to be no good reason why cream that contains 30 per cent. fat should not make twice as much butter as that containing 15 per cent. and why the one is not worth twice as much per inch as the other. We therefore claim that the only true basis for valuation is the butter fat content.

Cream from the milk of different cows or even herds, raised by the cold deep setting process, often varies five or six per cent. in fat under the most favorable conditions. If, then, a creamery buys cream at 15 cents an inch and Mr. A's cream contains 20 per cent. butter fat and Mr. B's 25 per cent., then A receives 75 cents for the same butter fat for which B receives but 60 cents.

It certainly seems to be more just and business like to pay a fixed price per unit for butter fat of known value, than to pay uniform rates per unit for cream of unknown value. Objections to the fat valuations have also been made on the ground that some cream churns with difficulty, especially that from cows advanced in lactation. This would be a valid objection providing each lot of cream was churned by itself, but it has been pretty well proved by experiment that when cream of poor churning qualities is ripened and churned with good cream, the separation of butter is just as complete, and no more fat is left in the butter milk, than when all good cream is churned.

INTERIOR OF EXPERIMENT STATION LABORATORY—Left Side.

INTERIOR OF EXPERIMENT STATION LABORATORY—RIGHT SIDE.

In regard to making the test when cream is bought by the inch, it can be said that it makes no difference whether the cream is bought by the inch, gallon, or pound. If, according to the common practice in this State, the cream is measured as it stands on the milk in the can, all that is necessary is to draw the cream off into another can or pail of the proper diameter and make a second measurement in order to know how much milk has been drawn with it. The sample is taken from the thoroughly mixed cream after it is drawn off and having the two measurements the calculations is very simple.

If the cream measured 8 inches in the can and 10 inches after being drawn off with some skim milk and tested 20 fat, then to find the per cent. of fat in the cream before any milk was mixed with it we have the simple proportion 8 :10 : :20 :x.

X in this case equals 25 per cent.

If a patron of a creamery furnished 100 inches of cream for a week that tested as above, then he would be entitled to 25 units of butter fat.

Some creameries draw the cream off into a collector's pail before measuring, while others buy it by the gallon. With these methods a second measurement is not necessary when the sample is taken for the test.

Some creameries are co-operative and the butter receipts are divided among its patrons. In such cases the test can be used equally well for a proper division of the proceeds. Suppose A. B. and C. are patrons and

A furnishad	100	in.	cream,	testing	20% =	20 units.
B	"	200	"	"	25% =	50 "
C	"	500	"	"	18% =	90 "
	Total,					160 "

From this cream 380 lbs. of butter are made.

Then A's share is	2-16	of	380	lbs.,	= 47½ lbs.
B's "	5-16	"	380	"	= 118¾ "
C's "	9-16	"	380	"	= 213¾ "

REPORT OF THE HORTICULTURIST.

PROF. W. M. MUNSON.

As noted in the reports of the Experiment Station for 1889 and 1890, several varieties of orchard fruits and small fruits have been obtained by the Station, and some have been distributed to different parts of the state. Previous to the present year, however, there had been no organized department of horticulture, and as the work came under my charge in February, the past year has necessarily been largely taken up with pioneer work.

At the time the department came under the charge of the writer, a forcing-house, 20x100 feet, had just been completed. (See Plate I.). The house is well constructed. The frame work is of cypress, and the walls are of grout, while the building is heated by hot water. The house is divided in the center by a glass partition, and the hot water pipes have been so arranged that one part may be kept at a much lower temperature than the other. The warm house is arranged for bottom heat, and the cool house for over-head heat.

At the present time the warm house is used for tomatoes, cucumbers and beans; while the other is devoted to lettuce, radishes, cauliflowers and other plants requiring the lower temperature. Plate II is from a photograph of the interior of the cool house, as it appeared in December.

The building in connection with the forcing house, was erected during the year at a cost of about one thousand dollars, a part of the expense being borne by the college. The building contains, besides the furnace room and a room for the smaller garden tools, a general laboratory and work room, a small office, a room for herbarium work, and a well appointed photographic studio. In all of our work photography is made to play an important part as a means of preserving accurate records.

The grounds devoted to this division include about ten acres of land of varied character. More than half of this area is devoted to fruit culture. The apple orchard contains about 115 varieties, 52 of which are Russian varieties obtained from Professor Budd, of Iowa. There are also 23 varieties of pears, 30 of plums, 12 of cherries; also, quinces, 2 varieties; blackberries 9 varieties; raspberries 13 varieties; currants 7 varieties; gooseberries 3 varieties; strawberries 17 varieties. As the college campus is under the supervision of the writer, a considerable amount of experimental work is done with ornamental plants on other areas.

Variety testing, as such, either of fruits or vegetables, is not made a leading feature of our work. While we cultivate most of the novelties which promise well for the trying climate of the state, the more important part of our work is perennial, and has to do with the investigation of certain cultural problems, and of certain of the laws of plant variation. While it is designed to make the work practical, so far as possible, we must recognize the fact that any work to be of permanent value, must be based on sound principles. With this idea in mind, we are making a special study of the effects of climate on plant variation. We are also making an extensive study of the effects of pollination. Practical application of the principles involved, and of the facts learned, is made in our attempts to ameliorate certain of our native fruits, and to extend the list of fruits and vegetables which may be profitably grown in this region. Numerous crosses and hybridizations have been made and valuable results are indicated.

Our work with egg plants commenced two years ago, and the past season some two hundred plants, of the second generation from the crosses, were grown on our grounds. Selections have been made from the more promising of these, and the work will be continued and extended.

The forcing of vegetables under glass is made an important feature of our work. It is believed that from a practical point of view, this line of work is destined to become of great importance to the people of the state. While a study of methods of culture is made, and also of varieties suitable for forcing, at the same time, the material thus grown furnishes the best possible opportunity for conducting the work of crossing, as the conditions of growth are under control. We are now forcing tomatoes, cucumbers, beans, lettuce, radishes, cauliflowers and some others. Plate III is a view of the tomato house as it appeared about the first of January.

Recognizing the importance of the fruit industry of the state, and the necessity of combating the insect and fungous enemies which are proving a serious obstacle to success, experiment have been conducted during the year to determine the effectiveness of certain insecticides and fungicides. The results obtained are very encouraging and the work will be continued and extended during the ensuing year.

Attention is being given to the amelioration of our native fruits, and to developing the possibilities of fruit culture in the more trying localities of the State.

Following is given somewhat in detail a part of the work of the year. Some of the work being incomplete, the report will be made later.

THE VEGETABLE GARDEN.

Owing to the fact that the soil intended for vegetable gardening was badly infested with "witch grass," it was thought best to subdue the land before undertaking much work with vegetables. Our attention during the past season has been given chiefly to certain points in the culture of cabbages, tomatoes and egg plants.

I. NOTES OF CABBAGES.

Some twenty varieties of early cabbages were grown; the special design being to study the effect of different methods of culture, and to compare the relative merits of seed from the east, and from the extreme northwest, as well as to try some of the newer varieties not yet placed on the market.

1. *Culture:* In general, cabbages for early use should be started in hot beds or forcing houses from the first to the middle of April. To prevent crowding, transplant once or twice before setting in the open ground in May. If the plants are "hardened off," *i. e.* gradually exposed to lower temperatures, before being placed out of doors, they will stand a light frost without injury. Frequent cultivation is advisable.

2. *Influence of Transplanting:* It is a common practice among gardeners to handle certain vegetables from one to three or four times before setting in the open field; the object being to render the plants "stocky," and, it is thought, better able to withstand the shock of final removal to the field. The operation is also thought to hasten the maturity of the plants, and to increase the production of fruit. How far these impressions are correct, we are not as yet prepared to state. Some contend that this manipulation of the plants tends to dwarf them, thereby reducing the amount of fruit, or in case of cabbages, the size of the head.

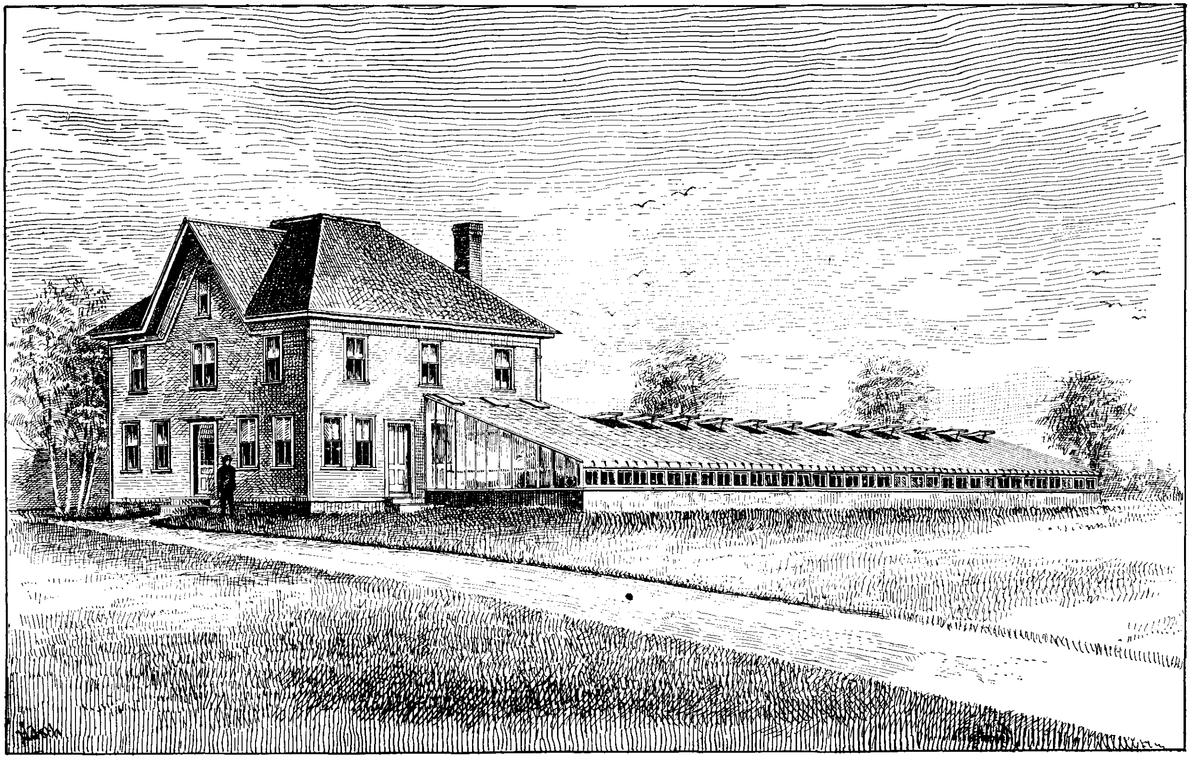


PLATE I. FORCING HOUSE, MAINE EXPERIMENT STATION.

It is the practice of the writer to handle cabbages, tomatoes and other vegetables started under glass, in pots, so far as possible. In this way the plants suffer little or no check in transplanting, and with some sorts at least, better results are obtained. Plants grown in boxes or flats, are necessarily mutilated each time they are handled.

To determine the extent of the influence of the different methods of treatment on the development of the cabbage, a portion of the plants were handled in pots and the remainder in flats till ready for the final transfer to the field. The plants handled in pots were removed from the seed-flats to 3-inch pots, and later to 4-inch pots. Those handled in boxes were placed about two inches apart at the first transplanting, and about four inches each way at the second. When put out in the field, all were placed in rows three feet apart, and two feet apart in the row.

Table I shows the results obtained.

TABLE I.

VARIETIES.	No. of heads.	Heaviest head. lbs.	Lightest head. lbs.	Av'ge weight. lbs.	No. of heads cracked.	No. of immature heads.	No. of plants not cut.	Ratio.	Remarks.
JERSEY WAKEFIELD. (Thorburn.)									Cut July 28.
Pots	25	3.0	1.0	1.8	2	2		1.38	
Boxes	24	2.0	.7	1.3	2	1	4	1.00	
JERSEY WAKEFIELD. (March.)									"
Pots	17	2.75	1.0	2.0	2	5	2	1.33	
Boxes	8	2.25	.75	1.5	1	2	2	1.00	
EARLY ETAMPES. (Thorburn.)									Cut Aug. 26
Pots	25	3.1	1.1	2.4	0	4		1.00	
Boxes	14	4.5	1.7	3.8	3	1		1.58	
BRUNSWICK. (Thorburn.)									"
Pots	14	7.4	3.0	5.0	0	0		1.22	
Boxes	11	5.9	2.1	4.1	0	0		1.00	
STEIN'S FLAT DUTCH. (Thorburn.)									"
Pots	18	11.9	6.4	8.1	6	0		1.00	
Boxes	15	11.7	5.5	9.1	1	0		1.11	

With three varieties, heads from the plants handled in boxes were lighter, and in two cases they were heavier than those from the pots. *Brunswick* averaged .9 lb. per head heavier from pot-grown plants, while *Flat Dutch* gave an equal difference in favor of the boxes.

Conclusion: From the results obtained, it appears that disturbing the roots in transplanting cabbages, has no marked effect on the size of the head or the time of maturity, if the plants are given good after treatment.

3. Influence of Deep and Shallow Setting, Combined with Other Treatments: It is commonly taught that cabbage plants should be set deeply; that long "leggy" plants will not produce good heads. From extensive trials at other experiment stations during the past two years, it has been pretty clearly shown that the practice of deep setting has not the importance commonly attached to it.† Having a few surplus plants, however, the question of deep and shallow planting was included with certain other cultural problems. The variety used was Jersey Wakefield.

Table II gives the results.

TABLE II.

HOW HANDLED.	Number cut.	Heaviest head. lbs.	Lightest head. lbs.	Av'ge weight. lbs.	No. of heads cracked.	No. of heads immature.	No. of plants not cut.	Remarks.
a.—Pots, deep, 3 times.......	17	2.75	1.00	**2.00**	2*	5	2	
b.—Pots, shallow, 3 times ...	19	2.25	.75	**1.58**	2*	5	1	* Slightly.
c.—Box, deep, 3 times.......	8	2.25	.75	**1.55**	1	2*	2	"
d.—Box, deep, 2 times	13	2.50	1.00	**1.50**	2	1*	2	"
e.—Box, shallow, 3 times....	8	1.62	1.12	**1.37**	0	0	4	
f.—Box, shallow, 2 times....	13	2.00	1.00	**1.29**	1	1	0	

The first column in the table shows the number of times the plants were handled, and the manner of handling. "Deep" indicates that the plants were set up to the seed leaves at the first transplanting, and still deeper at each subsequent handling. "Shallow," indicates that the plants were set no deeper than they naturally grew

† See Bulletins 15 and 25, Cornell University Experiment Statio[illegible]

in the seed flat. Seed was sown March 23. The plants transplanted three times were handled April 6, April 24, and May 19, when all were put out in the open field on clayey loam of only moderate fertility. Those transplanted twice were handled April 6 and May 19.

A study of the table will show, first of all, that plants grown in pots and set deeply gave decidedly the best results. This method of treatment seems specially suited to the variety under discussion. In previous trials we have observed that Jersey Wakefield has usually given better results when set deeply.

It will also be observed that from the plants handled three times, the average weight of the heads was invariably greater than from those handled twice. It is probable that the reason for this lies in the fact that the actual mutilation was necessarily less, when the plants were handled more frequently,—the root system being less widely extended.

Conclusion: The heaviest heads were obtained by frequent transplanting and by setting the plants deeply. This may not be a general rule applying to all varieties.

Frequent transplanting increased the average size of the heads.

4. *Varieties:* A good cabbage has a short stem; leaves placed close together, and having short petioles, thus leaving little open space about the stem. The blade should be large enough to extend more than half way around the head to avoid the soft spot often seen in the center. The leaves should also embrace each other very firmly. Firm, solid heads are less subject to the attacks of the "cabbage worm," than are loose, open ones. This fact is of no small importance in selecting a variety.

Most of the varieties grown are well known, and require no special description. A few may be mentioned, however, to direct the attention of planters to the more valuable ones for the home garden.

Jersey Wakefield. Small, conical, firm. The best of the very early varieties. This old variety, though popular for many years with market gardeners, is too often unknown in the average home garden.

Brunswick (Fottler's.) Medium size, depressed, very firm. Leaves closely set on the stem; blade well developed, second early. One of the best.

Early Summer: Medium size, nearly spherical, firm. About ten days later than Jersey Wakefield. Good.

Early York: Medium size, loose, open. Should have been discarded long ago.

Flat Dutch: Large, flattened, solid. A standard late variety.

Two new varieties were sent for trial by Francis Brill, Hempstead, N. Y. The names given both varieties, "Nonesuch" and "Worldbeater," are objectionable and would tend to make planters hesitate before selecting them.

Nonesuch: Light colored, very glaucus. Heads of medium size, flattened, resembling Early Summer. Stems short; leaves closely set, and well developed. Early. Worthy of further trial.

Worldbeater: Light colored. Head of medium size, spherical or oblong. Leaves much cut and wrinkled; not closely set on stem; petiole long.

SUMMARY.

1. Disturbing the roots of cabbage in transplanting, appears to have no marked effect on the size of the head.

2. The best results were obtained by frequent transplanting.

3. In general, depth of setting seems to have little influence on the size of the heads; but Jersey Wakefield gave better results from deep setting.

4. Firmness is an important characteristic of a good cabbage, as such heads are less injured by attacks of the cabbage worm.

5. Of the older varieties, Jersey Wakefield, Brunswick, Early Summer, and Flat Dutch are good for general culture; Early York should be discarded.

6. Of the newer varieties tested, Nonesuch is promising.

II. NOTES OF TOMATOES.

1. *Culture:* One of the important problems in tomato culture for the state of Maine, is that of securing *earliness.* As a rule, plants purchased of the local dealers are drawn and "leggy," being crowded together in small boxes. When set in the field the shock is such that several weeks are required for the plants to recuperate; consequently no fruit sets till late in the season, and the larger portion of the crop is still unripe when the vines are killed by frost. In general, these weak, drawn plants are not worth setting.

Plate II. INTERIOR OF COOL HOUSE.

Frequent "handling" or transplanting, is found to be the best method of securing strong, stocky, well developed plants. Some of the best cultivators combat this idea, but in our own experience the transplanting has been found beneficial. The practice of the writer is to sow the seed in "flats,"—shallow boxes about 16 by 24 inches and 3 inches deep—about the first of April. When the first true leaves have nicely started, or as soon as the plants begin to crowd, they are transferred to 2-inch rose pots. As the pots are so small, we usually plunge them in sphagnum to prevent too great extremes of moisture. As soon as the pots are well filled with roots—usually in two or three weeks—the plants are re-potted into 3-inch or 3 1-2-inch pots. Later they are again handled into 4-inch pots and given an abundance of room; being finally transferred to the open ground, from the first to the middle of June. If short of pots, we sometimes handle the plants in flats until they are ready for the final transfer. In this case they are usually placed about two inches apart each way at the first handling, and four or five at the second. By this treatment the roots are confined to a comparatively small space, and the plants suffer less severely when planted out. The plants are set in the field in rows five feet apart each way, and the horse cultivator is used freely.

2. *Effect of Early Setting:* It is commonly held that tomato plants should not be set out in the field till the cool nights of early summer are past—certainly not before the middle of June. The results of an experiment conducted last year, however, indicated that earlier setting was at least not detrimental, and might be beneficial.*

To test the matter further, fifteen plants of Perfection, as nearly alike as possible, were selected and given the same treatment while in the house. Five plants were set in the field on sandy loam having a southern aspect, May 18. Five more were placed by the side of these May 30, and the other five were set next to them June 8, when the main crop was planted out. Plants set May 18 and May 30 were injured by frost May 31.

The results were as follows:

	a. May 18.	*b.* May 30.	*c.* June 8.
Average number fruits per plant	47.0	33.0	20.0
Average weight of product, in pounds	16.1	12.4	6.9
Average weight per fruit, in ounces	5.4	5.9	5.6

* Bulletin XXI Cornell University Experiment Station.

The total average product was in direct proportion to the earliness of setting. The relative earliness was also observed to follow the same order.

The total product of the five plants for the month of August was respectively:

	Number of fruits.	Weight. lbs.
a	31	8.5
b	25	7.4
c	14	4.2

The season was exceptionally long, but even so late as September 30, the earlier plants maintained their superiority. The last two pickings, Sept. 26 and 30, gave the following results:

	Number of fruits.	Weight. lbs.
a	163	57
b	118	43
c	67	23

Conclusions: On warm, sandy soil, the earliness and productiveness of tomatoes was in direct ratio to the earliness of setting in the field.

A chill, and even a slight cutting by frost is not as fatal to success as is commonly supposed.

It is well, in practice, to set some plants in the field early in the season, holding others in reserve to replace the first if killed by frost.

3. *Effects of Trimming Tomatoes:* With a view to applying the principle that "checking growth induces fruitfulness," to the culture of tomatoes, several varieties were operated upon in 1890. The results, as a rule, indicated that trimming the vines is a profitable method of inducing earliness, and consequently of increasing the portion of the crop available. The total increase in the number of fruits ranged from 5.5 per cent. to 47.6 per cent.

During the past season the trial was repeated. Plants of *Perfection* and *Chemin Market* were used in the test. Twelve plants of the former and five of the latter were headed back July 24, Aug. 8, and Sept. 5. At each trimming the leading branches were shortened about six inches, and most of the side shoots below the first clusters of fruit were removed, the others being shortened. The sunlight was thus freely admitted to the fruit, and picking was rendered much easier. The following figures are significant.

	Average No. fruits per plant, ripened Sept. 30.	Average weight of product in lbs.	Average weight of individual fruits, in ounces.	Per cent. gain by number.	Per cent. gain by weight.
*PERFECTION.					
Trimmed	45	17.1	6.1	36.3	44.0
Not trimmed	33	11.8	5.6		
CHEMIN.					
Trimmed	12	3.8	4.9	50.0	58.3
Not trimmed	8	2.4	5.0		

* A portion of the Perfection plants used in this test were set out in May, hence the two varieties should not be compared in this case.

The average number of fruits, and also the weight of the product was materially increased by trimming the vines. The size of individual fruits was increased in one case, but in the other there was a slight decrease.

Conclusions: Trimming tomato vines hastens maturity of the fruit, and consequently increases the portion of the crop which is available, or the apparent yield of the plants.

As the time required for the work is small, the practice will doubless be a good one for amateurs.

4. *Color of Fruit:* Numerous attempts have been made to improve upon the color of the fruit of the tomato. As the color is quite variable, and as the yellow varieties are sports from the red, it has been thought possible to secure a yellow fruit with a blush cheek. With this purpose in view, numerous crosses have been made between red and yellow varieties. In 1890, several successful crosses were made by Mr. C. W. Matthews of Cornell University, and seeds from one of these, in which Golden Queen was used as the pistillate parent and Ignotum as the male, were grown by the writer during the past season. The plants were very vigorous and productive, but failed to show any trace of the influence of the female parent. The fruit was in every way, as to form, color and size, typical of the true Ignotum. Similar results were obtained by Professor Bailey at the Cornell Experiment Station.

Observing a slight tendency on the part of Golden Queen, to vary in the desired direction, a selection was made in 1890. The past season the tendency was much more marked, and some very handsome fruits resulted. If the color can be fixed, the desired end will have been accomplished. It seems probable, however, that selection in this direction will cause a reversion of the form to the red type, as red is the normal color of the species.

5. *Varieties.* It has not been deemed advisable to grow a large number of varieties; but rather, to select the best of the older, well known sorts, and such new ones as may appear from time to time. Earliness is one of the principal measures of value for any variety in this climate, and many valuable sorts must be discarded because they are not early. I am aware that some contend that there is practically no difference in earliness, but the fact remains, and we must shape our course accordingly. Owing to the unusually long season, all varieties ripened some fruit during the past year.

Beauty. (Livingston).—Of medium size, bright pink, smooth, uniform, prolific. A well tried and valuable sort.

Chemin Market. (Cornell University, Vaughan).—Small to medium, bright red, smooth, prolific; uniform in size and shape, somewhat resembling Hathaway. Possibly too late, but worthy of further trial.

Cleveland. (*President Cleveland*, Farquhar).—Small, red, corrugated about the base. Plant vigorous, but only moderately productive.

Favorite. (Livingston).—Of good size, bright red, smooth. As usually grown, a deservedly popular variety. The strain grown this year was not equal to that grown before, however.

Faultless. (*Faultless Early*, Farquhar).—Small, early, bright red, flattened or indented at apex. Early fruits very irregular; later ones better. Plant of medium size, productive, matures early.

Golden Queen. (Cornell University, Livingston).—Of medium size, spherical, smooth, clear golden yellow with occasionally a blush cheek; early, prolific. The best yellow tomato, and a valuable sort for the home garden.

Ignotum. (Cornell University).—Large, smooth, deep red, firm and meaty, with few seeds; early and productive. This variety originated at the Michigan Agricultural College, and has been on the market only two or three years. From well selected stock it easily ranks at the head of the red tomatoes.

Ithaca. (Cornell University).—Small to medium, light cherry, firm, smooth, of good quality, but appears to possess no characteristics which render it more valuable for field culture than some of the older varieties. The variety is a local one grown by gardeners in the vicinity of Ithaca, N. Y., for many years. It is not yet catalogued by any of the seedsmen. We have the variety growing in the house at the present time, and are very much pleased with it as a forcing variety.

Long Keeper. (Thorburn).—Of medium size, light purple, smooth, symmetrical, ripens evenly without tendency to rot. Promising.

Lorillard. (Cornell University).—Of medium size, nearly spherical, bright red, smooth, fairly productive. The special value of this variety is as a forcing tomato. For this purpose it is one of the best.

Mitchell. (Gregory).—Small to medium, inclined to be irregular, bright red. A rampant grower.

Peach. (Thorburn).—Small, purple, very prolific; soft but keeps well. Unlike any other tomato, this variety has a rough skin and when just maturing the resemblance to a peach is quite noticable. Valuable for amateurs.

Potomac. (Harris).—Of the Acme type; large, purple, corrugated about the stem, soft.

Prelude. (Thorburn).—Small, nearly spherical, smooth, uniform, early, very prolific. Valuable for the amateur.

Red Cross. (Farquhar).—Of medium size, smooth, bright red.

Ruby. (Henderson).—Small, red, inclined to be angular. Plant of weak habit. Not as satisfactory as in 1890.

Stone. (Livingston).—Medium to large, smooth, regular, bright scarlet, productive. Promising.

The varieties which appear to us most valuable for general culture are, Ignotum, Perfection, Beauty and Golden Queen, with the possible addition of Prelude for the home garden.

Of the newer varieties, Long Keeper and Stone are promising. Ruby does not hold its own. Ithaca is a promising variety for forcing.

SUMMARY.

1. An important requisite to successful tomato culture is that the plants be kept growing vigorously; a condition involving rich soil and frequent tillage.

2. Frequent transplanting makes stocky plants.

3. Plants are not checked as much as is commonly supposed, by the cool nights of early spring.

4. Other things being equal, the earliness and productiveness of tomatoes is in direct proportion to the earliness of setting in the field.

5. Trimming the plants after a part of the fruit had set, increased the yield by more than one-third.

6. The best varieties for general use appear to be Ignotum, Perfection, Beauty, Golden Queen, and possibly Prelude for home use.

7. Of the new varieties, Long Keeper and Stone are most promising.

III. NOTES OF EGG PLANTS.

As already noted, we are making the egg plant a subject of special study. A full report in regard to this work is reserved till a later date, however.

Egg plants delight in a warm, moist climate, rich but light soil, and constant cultivation. While they reach the highest state of perfection in warmer climates, and near the coast, by careful treatment they may be grown over a large extent of country. In this climate they should be started as early as the first of April, in a hot bed or forcing-house, and should be kept growing vigorously till about the middle of June, when they may be removed to the open field. They should be placed in rows about three feet apart to permit the use of a horse in cultivating.

Frequent and thorough cultivation is a prime requisite to success. We make a practice of going through the plantation at least once a week with a Planet Jr. cultivator, and make free use of the hoe as well.

Of the varieties commonly catalogued, *Early Long Purple* and *Early Dwarf Purple* will doubtless prove most satisfactory in this climate. The larger and later sorts will hardly begin to develop fruit before the early frosts. There is reason to believe, however, that valuable results may be obtained by crossing these early, prolific varieties with some of the larger sorts. From crosses we now have growing, more satisfactory results were obtained during the past season, than from any of the older fixed varieties.

FRUIT TESTS.

The Experiment Station is not situated within the section of the state best adapted to fruit culture. Being on the flat bottom lands in the valley of the Penobscot, conditions of soil and climate are different, and somewhat more trying than in other portions of the state. This fact has its advantage, however, as varieties which prove hardy at Orono will probably succeed in any of the southern counties of the state.

The scope of the work already in progress has been indicated in a general way in the annual reports of the Experiment Station for 1889 and 1890. At the beginning of the present year, when the orchard came under the care of the writer, the trees were in a very bad condition from the effects of the severe winter.

The winter of 1890-1 was one of the coldest known for twenty years; the mercury on one occasion reaching —36.3°, while the mean temperature for December was 12.2° Fahr. The fruit plantation is on warm, rich soil, and the trees failed to mature the new growth. Consequently, trees which should prove hardy in our climate were either killed or severely checked. The loss was specially marked in case of pears and plums.

An all important requisite of hardiness is that the wood complete its growth early in the season, and become well matured before cold weather approaches. Hardiness is therefore only relative, and may in a measure be controlled by the cultivator. Orchards and fruit plantations generally, should not be cultivated after the first of August, till growth is checked by heavy frost.

The following field notes indicate in a general way the condition of the orchard at the beginning of the year, and the relative hardiness of different varieties:

PEARS

Angoulême	Killed.
Anjou	Considerably injured.
Bartlett	Top killed. Sprouts above graft.
Clairgeau	One killed outright. The others, top killed, but sprouts appear.
Clapp's Favorite	In good condition.
Flemish Beauty	" " "

Hardy	One killed, the other injured.
Howell	Slightly checked. Starts well.
Josephine de Malines	One killed to the roots; the others badly injured.
Keiffer	Killed.
Lawrence	Slightly injured.
Le Conte	Killed.
Louise Bonne	Top killed. Sprouts above graft.
Seckel	Killed.
Sheldon	In good condition.
Souv. du Congres	One killed; the others badly injured.
Superfine	Considerably injured.
Winter Nellis	Slightly checked; starts well.

PLUMS.

Blue Damson	One killed outright. The others top killed.
Bradshaw	Uninjured; not vigorous.
Duane Purple	Uninjured.
Gen. Hand	All but one dead; this, badly checked, but starts well.
German Prune	Uninjured.
Golden Drop, (Coe's)	Checked, but starts vigorously.
Imperial Gage	All but one killed; this badly injured.
Jefferson	One killed, the others badly checked.
Lombard	Very badly injured. Had made remarkably strong growth the previous season.
Moore's Arctic	Uninjured.
Pond's Seedling	One killed, the other badly checked.
Quackenbos	Uninjured.
Reine Claude	One killed; the others badly injured.
Simons' (Prunus Simoni.)	" " " " "
Smith's Orleans	" " " " "
Washington	" " " slightly "
Weaver	Badly checked, but starts vigorously.
Wild Goose	Killed.
Yellow Egg	Uninjured.

CHERRIES.

Of the eight varieties of cherries, but one, Gov. Wood, was seriously checked, and this one made a good growth during the past season. Part of the varieties were protected, however, by means of a cedar hedge on the northwest.

The data are interesting, as showing the condition of the experimental orchard after the first hard winter, and as exhibiting unexpected variations in hardiness. Of the pears, those least

PLATE III. GROWING TOMATOES UNDER GLASS.

injured by the winter were: Clapp's Favorite, Flemish Beauty, Howell, Lawrence, Sheldon, and Winter Nellis. Of plums, the most hardy appear to be: Bradshaw, Duane Purple, German Prune, Moore's Arctic, Quackenbos, Washington, and Yellow Egg. The injury to Lombard, one of our hardiest varieties, is in accordance with the statement before made, that hardiness is only a relative condition. This variety, because of its vigorous, watery growth, failed to mature the wood and suffered accordingly.

During the past year the orchard has been largely extended and the trees have made a vigorous growth. Several of the newer varieties of apples and pears, as well as some older ones not common in this region, have been added to the collection. Several varieties of plums, cherries and quinces have also been added.

Small fruits are also receiving due attention. The climate of the state is such that cultivators may take advantage of the natural conditions of the markets, and with suitable varieties, make the culture of small fruits a very profitable industry. The fruit may be put upon the market at a season when there is little competition from other sources, and when the best fruit will command high prices. We are endeavoring to determine the best of the hardy varieties now before the public, and to secure by means of selection and crossing, new varieties specially adapted to the climate, and to the demands of the natural markets of the state.

During the year, the following varieties have been added to the collection of small fruits. (The list of varieties before planted was published in the annual reports for 1889 and 1890.)

Blackberries: Agawam, Ancient Briton, Early Cluster, Stone (Stone's Hardy).

Raspberries: Hansell, Marlboro, Turner, Tyler, Johnston (Johnston's Sweet).

Currant: Prince Albert, La Versaillais.

Gooseberries: Whitesmith, Downing.

No part of the state is better adapted for the general operations of agriculture than is Aroostook County. The winters are so severe, however, that fruit culture has heretofore received little attention. Until the advent of the Duchess and the Wealthy, all attempts at apple culture resulted in disappointment. It is but few years since the positive assertion was made, that fruit culture is impossible north of the latitude of Houlton, (46° 10').

By steady perseverance on the part of a few enterprising planters, however, there are now thriving orchards in the latitude of Presque Isle and Caribou, and even as far north as Fort Kent, on the extreme northern boundary of the state.

The range of varieties is very limited in this northern region, however; the standard of hardiness being the Duchess and the Wealthy. Some valuable seedlings of these varieties have been produced and the number is gradually being increased. Dudley's Winter, a seedling of Duchess, is of much promise and is being extensively propagated. The variety originated with Mr. J. W. Dudley of Castle Hill Plantation.

In the hope of extending the list of apples and other fruits which may be grown in the more rigorous portions of the state, arrangements have been made with Mr. James Nutting of Perham, who has perhaps the largest orchard in northern Aroostook, to test certain varieties sent him and report to this department from time to time.

In April of the present year, cions of the following varieties of apples were sent to Mr. Nutting: Severs, Iowa Blush, McMahon, and Harry Kaump, from the U. S. Department of Agriculture.

Peach of Montreal, Prolific Sweeting, Longfield, Titus, Bethel of Vermont, Yellow Transparent, and Shiawassee Beauty, from Dr. T. H. Hoskins of Newport, Vermont.

"Sally" and Sweet Seedling, two seedlings of promise, from D. H. Knowlton, of Farmington, Me.

A few cions of Shiawassee Beauty were also sent from the college orchard for comparison with those from northern Vermont.

In addition to the apples, cions of the Hawkeye plum were sent, and grafted in the native Canada plum, (*Prunus Americana*). Part of the apple cions were set in bearing trees, Duchess, and part in Duchess seedlings, one year stock.

The following is Mr. Nutting's report concerning the first year's growth:

Cions set in bearing trees: The trees are about twelve years old and being set 12x12 feet, are somewhat crowded. The cions, except those from Vermont, and the seedlings, were not in good condition, growth having commenced in most instances.

GROWTH OF CIONS IN BEARING TREES.

Variety.	Where obtained.	Number cions set.	Number cions living.	Average growth in inches.	Date of setting.
Harry Kaump	Dept. of Ag.	4	3	6	May 14.
Iowa Blush	" "	6	6	8	"
McMahon	" "	4	2	5	"
Severs	" "	6	3	5	"
Sally	Knowlton.	5	5	5	"
Sweet Seedling	"	2	2	20	"
Bethel of Vermont	Hoskins.	6	6	11	"
Longfield	"	6	5	6	"
Prolific Sweeting	"	6	6	16	"
Titus	"	4	2	18	"
Shiawassee Beauty	"	6	5	12	"
Shiawassee Beauty	College.	5	3	11	"

Cions set on seedling stock: Saddle or splice grafts were made on one year seedling stocks, and they were planted out the same day.

Variety.	Where obtained.	Number cions set.	Number cions living.	Average growth in inches.	Date of setting.
Iowa Blush	Dept. of Ag.	8	3	14	May 16.
McMahon	" "	3	0		"
Severs	" "	6	1	12	"
Bethel of Vt.	Hoskins.	6	6	24	"
Longfield	"	2	2	12	"
Prolific Sweeting	"	5	5	12	"
Shiawassee B.	"	7	3	14	"
Titus	"	4	4	12	"
Sally	Knowlton.	5	3	18	"
Sweet Seedling	"	2	1	20	"

The season was very dry and bad for nursery stock. All of the young trees were taken up November 12, and healed in for the winter.

The above report is given, not as indicating valuable results obtained, but as showing in a general way the work commenced in the "cold northeast." The deep snows constitute a serious obstacle to successful nursery culture during the first year or so. It is for this reason that the trees were taken up the first winter.

During the coming year the list of varieties under trial will be materially increased, and the culture of certain small fruits undertaken. The conditions of soil and climate seem specially adapted to the growth of currants and gooseberries. The only plum which has as yet proved satisfactory in northern Aroostook, is Moore's Arctic, which originated at Ashland in that section. Even this variety requires laying down each fall.

The native "Canada plum," *Prunus Americana*, is very variable in its character, and the region in question is specially rich in promising types of this species. Several selections of the more promising forms have been made, and it is hoped by careful selection and culture, valuable "iron-clad" varieties may be obtained.

Trees and cions of Rollingstone and Hawkeye plums were procured last spring, and others of the hardy native varieties from the northwest, as well as some of the better Russian sorts, will be introduced next season.

EXPERIMENTS IN SPRAYING.

The great and increasing importance of the fruit interests of the state seem to demand special attention on the part of the Experiment Station, and as the depredations of the insect and fungous enemies of the orchard are becoming more and more severe year by year, it has been decided best to do all in our power to combat these pests.

In other states it has been shown, apparently beyond question, that at least some of these orchard pests may easily be held in check. While it is not to be supposed that conditions of soil or climate would render the work of other experiment stations of no value in Maine, it has been thought best to prove for ourselves, and to the satisfaction of the people of the state, the effectiveness of certain remedies, if they are effective. In the reports of this Station for 1889 and 1890, Professor Harvey urged the use of certain insecticides and fungicides and gave full directions for applying, with descriptions and cuts of various kinds of spraying apparatus. Heretofore, however, no field work has been undertaken by the Experiment Station. By mutual understanding this work has been placed in the hands of the writer.

Owing to the fact that the orchard belonging to the Experiment Station is not of bearing age, and that there are no large orchards in the vicinity of the college, the work has necessarily been at a disadvantage. It was necessary to go to Kennebec county to find suitable orchards which were available. Much credit is due to the parties who have given the use of their orchards and have so faithfully assisted in the work. Special credit is due Messrs. Charles S. Pope of Manchester, W. P. Atherton of Hallowell, C. E. Moore and F. M. Woodward of Winthrop. These gentlemen all gave their time freely, and their intelligent assistance is appreciated.

There were two main objects in the field work of the present season: *first*, to combat the codling moth; and *second* to prevent, if possible, the ravages of the apple scab.

I. Codling Moth, (*Carpocapsa pomonella*).

For a number of years several prominent experimenters and many progressive orchardists, have advocated the use of the arsenites, Paris green or London purple, to hold this pest in check. The experiments of Cook, Goff, Gillette and others would seem to leave little doubt as to the value of this treatment. However, for our own satisfaction, and to bring the matter more forcibly before the people of the state, the following work was undertaken:

1. *Is Spraying with Paris Green an Effective Remedy?* The first question asked by an orchardist, regarding any remedy or preventive, is: Does it prove effective? To answer this question, trees were sprayed in the orchards of Messrs. W. P. Atherton, of Hallowell; Charles S. Pope, of Manchester, and C. E. Moore of Winthrop.

In Mr. Atherton's orchard, a row of Rhode Island Greenings, and a row of Hubbardston Nonesuch were selected for the trial. Four Greening trees were sprayed with Paris green in the proportion of 1 pound to 250 gallons of water; an equal number received 1 pound to 300 gallons; and three trees were left unsprayed as checks. Of the Hubbardstons, one tree was sprayed with the mixture of 1 pound to 250 gallons; two, in the proportion of 1 pound to 300 gallons, and two were left unsprayed.

Two applications were made. The first one, June 11, just as the last blossoms were falling, was under the personal supervision of the writer. The second was made by Mr. Atherton two weeks later. The weather was hot and dry at the time of each application.

The fruit was gathered October 3d. With the help at command it was found impracticable to pick and count the fruit from all of the trees. Therefore, in case of the Greenings, two trees of each lot were taken, reference being given to the relative size and productiveness of the trees, so far as possible. All of the fruit was picked from the trees, and all that had fallen was gathered separately.

Table IV indicates the comparative results.

TABLE IV—RHODE ISLAND GREENING.

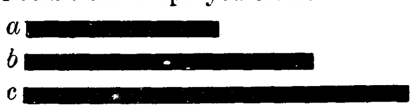
Treatment.	Nature of fruit.	Whole number of fruits.	Number wormy.	Per ct. wormy.	Average per ct. wormy.
1 lb. to 250 gals.....	1st tree:				
	Picked	453	39		
	Fallen.......	67	18		
	TOTAL	**520**	**57**	**10.96**	
	2nd tree:				
	Picked	727	25		**7.14**
	Fallen	98	14		
	TOTAL	**825**	**39**	**4.72**	
1 lb. to 300 gals.....	1st tree:				
	Picked	1069	101		
	Fallen	165	53		
	TOTAL	**1234**	**154**	**12.48**	
	2nd tree:				
	Picked	1100	47		**10.08**
	Fallen	145	49		
	TOTAL	**1245**	**96**	**7.71**	
Not sprayed........	1st tree:				
	Picked	1195	124		
	Fallen	228	114		
	TOTAL	**1423**	**238**	**16.02**	
	2nd tree:				
	Picked	556	73		**20.11**
	Fallen	253	138		
	TOTAL	**809**	**211**	**26.08**	

TABLE IV (Continued.)—HUBBARDSTON.

Treatment.	Nature of fruit.	Whole number of fruits.	Number wormy.	Per ct. wormy.	Average per ct. wormy.
1 lb. to 250 gals.....	Picked...........	773	13		
	Fallen............	36	28		
	TOTAL.....	**809**	**41**	**5.06**	**5.06**
1 lb. to 300 gals.....	1st tree:				
	Picked.......	681	11		
	Fallen.......	33	22		
	TOTAL.....	**714**	**33**	**4.62**	
	2nd tree:				
	Picked.......	836	75		**10.04**
	Fallen.......	83	56		
	TOTAL.....	**919**	**131**	**14.25**	
Not sprayed.......	Picked.......	652	145		
	Fallen.......	169	122		
	TOTAL.....	**821**	**267**	**32.52**	**32.52**

While none of the trees were as severely attacked as is the case some years, there was a marked difference between the sprayed and the unsprayed trees. The unsprayed Greening trees had an average of about 20 per cent. of wormy fruit; while in no case was there more than 12.5 per cent. on the sprayed trees, and in most instances the percentage was much lower. With the Hubbardstons the difference was fully as marked; the percentage of wormy fruit on the unsprayed trees being 32.5, while the highest percentage from a sprayed tree, the weaker solution being used, was but 14.25

By observing column five in the table, it will be seen that the percentage of wormy fruits is much less when the stronger mixture was used. By the use of the weaker mixture, nearly one-half, (49.8 per cent.), of the loss was prevented, while by the use of the stronger mixture the amount of wormy fruit was reduced by 64.5 per cent. The figure gives a graphic representation of the relative amount of wormy fruit under the different treatments; letting *a* represent the average amount of wormy fruit on the trees sprayed with the stronger mixture; *b* the weaker mixture and *c* the unsprayed trees.



In addition to the work above detailed, several Greening trees in another orchard some distance from the first were sprayed with

Paris green in the proportion of 1 pound to 250 gallons water. Two applications were made as in the other orchard. In getting data from this orchard, three hundred fruits were taken indiscriminately from all parts of each tree. The percentage of wormy fruits thus obtained, while not absolutely final, may be regarded as a fair basis for comparison. The trees were in parallel rows, thirty feet apart.

The following figures indicate the comparative results:

	Sprayed.			Not Sprayed.		
	Number of fruits.	Number wormy.	Per cent. wormy.	Number of fruits.	Number wormy.	Per cent. wormy.
1st tree......	300	44	**14.7**	200	74	**37.**
2nd tree......	300	40	**13.3**	300	113	**37.7**
3d tree.......	300	20	**6.7**	300	85	**28.3**

As will be seen, more than one-third (34 per cent.), of the fruit on the unsprayed trees was wormy; while on the sprayed trees, only one-ninth (11.5 per cent.), was wormy.

In other words, spraying the trees twice with Paris green reduced the number of wormy fruits by 66.3 per cent. and saved more than one-fifth, (22.5 per cent.), of the total crop.

Results in Mr. Pope's Orchard.

In order that we might have as many checks on our work as possible, an arrangement was made with Mr. Charles S. Pope, of Manchester, to spray a portion of his orchard with Paris green. But one application was made, June 25, when the fruits were about the size of acorns.

The results obtained are given in table V.

TABLE V.

Variety and treatment.	Sprayed. Whole number of fruits.	Free.	Wormy.	Per cent. wormy.	Not Sprayed. Whole number of fruits.	Free.	Wormy.	Per cent. wormy.	Ratio of sprayed to unsprayed trees.	Remarks.
Talman........ (1 lb. to 320 gal.)	344	274	70	**20.3**	392	226	166	**42.3**	**1:2.07**	All fruits picked from trees and all from ground that had fallen in 2 w'ks.
	397	308	89	**22.4**	681	371	310	**45.5**		
Baldwin....... (1 lb. to 240 gal.)	451	403	48	**10.6**	431	338	93	**21.6**	**1:1.61**	About 2½ bu. from all parts of each tree
	409	349	60	**14.6**	462	374	88	**19.0**		

The figures for each variety must be considered independently, as the trees were not in adjacent parts of the orchard. It will be seen, however, that in both instances there is a marked difference in favor of the sprayed trees.

The percentage of wormy fruit on both sprayed and unsprayed trees was much greater in case of the Talmans than with the Baldwins. A study of the table will show, however, that the actual increase of the sprayed over the unsprayed trees, in the amount of good fruit, was even greater in the first case. The figures are of value as showing the beneficial effects of even a single application of a dilute mixture.

As indicated in the last column of the table the ratio between the sprayed and unsprayed Talman trees is 1 :2.07. In other words, if in a barrel of fruit from the sprayed trees there were 100 wormy fruits, there would be 207 wormy fruits in a barrel from the unsprayed trees. In the same way for every 100 wormy fruits on the Baldwin trees which were sprayed, there would be 161 on the trees not sprayed.

2. *Relative Number of Windfalls on Sprayed and Unsprayed Trees.* Observing that the number of fallen fruits was much greater under the unsprayed trees, a record was kept showing the absolute difference.

In case of the Greenings (see Table IV) sprayed with 1 pound to 250 gallons, 1 pound to 300 gallons, and unsprayed, the average amounts were respectively, 12.5, 12.3, and 21.5 per cent. of the total crop. With the Hubbardstons the difference was even more marked, the percentages being respectively 4.45, 10.04, and 20.58.

The owner of the orchard not being ready to harvest his Baldwins, and it being impracticable for the writer to make another visit to this orchard, a count was made of the actual number of windfalls under sprayed and unsprayed Baldwin trees at that date, October 4. An examination of three trees each, as nearly alike as possible, gave the following as the *average* results.

	Whole number of fruits.	Number wormy.	Per cent. wormy.
Sprayed,	144	55	38.2
Not Sprayed,	268	222	82.8

The absolute number of windfalls in case of the unsprayed trees exceeded that from the sprayed trees by 53.7 per cent., while the relative number of wormy fruits was correspondingly large, the difference in the average being 44.6 per cent. The figures plainly indicate that the actual number of fallen fruits is less from trees sprayed with Paris green, also that the percentage of wormy fruits among the windfalls is smaller from the sprayed trees.

3. *Negative Results.* Incidental to some other experiments, a few trees in an orchard belonging to F. M. Woodward, of Winthrop, were sprayed with Paris green. The work was conducted by Mr. C. E. Moore.

When spraying for the apple scab, certain trees were sprayed once with a mixture of Paris green and carbonate of copper in suspension. The poison was used in the proportion of 1 pound to 160 gallons of water. The trees were old, and were surrounded by unsprayed trees.

About three bushels of fruit were counted from each of four trees, care being taken to obtain fruit from all parts of the tree.

The results were as follows:

Sprayed.			Not Sprayed.		
Perfect.	Wormy.	Per cent. wormy.	Perfect.	Wormy.	Per cent. wormy.
387	93	19.3	480	75	13.5
218	86	28.2	394	159	28.5

The results are indifferent or negative. The conditions were such, however, that little reliance is placed on this test.

4. *Point of Attack.* The objection has been raised by some of our fruit growers that a large proportion of the affected fruit is entered from side or base, and consequently that spraying before the fruit turns down has no special merit. Special attention was accordingly directed to this point. The variety under consideration was Rhode Island Greening.

No. of tree.	Whole No. of wormy fruits.	Entrance at calyx.	Entrance at side or base.	Ratio.	Remarks.
1	57	**24**	33	**1: 1.37**	Sprayed twice,—1 lb. to 250 gallons.
2	39	**14**	25	**1:1.78**	" " " " "
3	96	**32**	64	**1:2.00**	Sprayed twice,—1 lb. to 300 gallons.
4	154	**63**	91	**1:1.44**	" " " " "
5	238	**141**	97	**1:0.69**	Not sprayed.
6	211	**111**	100	**1:0.91**	" "

It will be observed that while the absolute number of wormy fruits is greatly in excess, in case of the unsprayed trees, the relative number of entrances at the calyx is more than doubled. The most plausible explanation for this condition would seem to be that the poison lodging in the calyx, had destroyed the larvæ attempting to enter that end, while those entering the side or base escaped. The larvæ of the second brood were also exempt.

It was observed that a large proportion of the fruits infested, had been attacked by the second brood, and the larvæ were still present. To spray for this later brood is hardly practicable, but if the earlier brood is held in check, there will be less trouble from the later.

In many cases the casual observer would attribute injury to the codling moth, when in reality it is due to another insect—a species of *crambus*. The larva of this moth is smaller than that of the codling moth, and works only in the calyx. This insect was quite abundant the past season and rendered the work of examination for the codling larvæ more difficult.

5. *Is Sprayed Fruit Unwholesome?* The objection is frequently raised that fruit which has been sprayed is unsafe for food; that enough poison will adhere to render the fruit dangerous to health. The matter has attracted some attention in England recently, and there has been an outcry against American apples. One writer in the *Horticultural Times* of London, is quoted as saying: "If the American apple as it comes from the vessel is carefully rubbed with the finger, it will be seen that a fine, delicate powder is in most cases removed. This is the arsenic adhering to the skin." (!)

There certainly is no doubt that fruit from which a coating of arsenic may be rubbed, would be very unwholesome. The objection is not valid, however, as the fine, white powder *is not Paris green.* A large part of the fruit sent from this state is shipped in empty flour barrels; a fact which doubtless accounts for the fine, delicate powder on the fruit referred to. I have yet to see the fruit which at maturity showed any visible effects of spraying, unless it were comparative freedom from worminess.

The charge as to the unwholesome character of sprayed fruit has frequently been refuted, and it is only necessary to call attention to the amount applied, to render further argument unnecessary. The strongest mixture recommended is 1 pound to 200 gallons water. (If carefully applied there is little doubt that 1 pound to 250 gallons is strong enough.) If we apply two gallons of the mixture to a single tree, we should use approximately 1-100 of a pound, or 70 grains of the poison on the whole tree at each application. The fruits are so small at the time of spraying that it would be impossible to make so much as 5 per cent. of the poison stay on them. There is not sufficient surface to retain a larger amount. Supposing this proportion correct, however, and that the trees are sprayed twice, if there are 1,200 fruits—about three barrels—to the tree, the amount of poison per fruit would be less that 3-1000 (.0029) grain.

In our calculations we have not taken into account the fact that the fruit is exposed to sunshine and rain for four months before it is ready for use. On considering all phases of the question we are led to the conclusion that there is no reason why fruit sprayed as directed should be unwholesome when mature.

6. *When to Spray.* In planning the work for the season, it was designed to learn, if possible, the best time to spray, as well as the amount of poison necessary. Owing to pressure of other work, however, the instructions left by the writer were not fully carried out.

The time when the first brood commences depredations, is not fully determined by entomologists; but it certainly extends over a considerable period and varies with the season. Professor Gillette has shown that in some seasons, at least, and with certain varieties, the larvæ may not hatch in considerable numbers for at least a month after the blossoms fall.* It would seem unnecessary, in such cases, to spray at once. With many varieties, however, the calyx closes soon after the blossoms fall, and later applications of the poison will necessarily be more or less ineffectual.

No doubt the fact that experimenters use different varieties, causes much of the difference in opinion as to the proper time to spray, and the value of the later applications. In case of the Duchess, the spray will be just as effective a month after the blossoms fall as at an earlier date. Hence, if the larvæ do not appear earlier, a single application at the later date will be just as effectual as two or more applications, part of which are made as soon as the fruit sets. With the Baldwin, however, the conditions are different. About two weeks after the blossoms fall, the lobes of the calyx close, and while the eggs may have been deposited, the poison applied as a spray is shut out.

It will be seen that it is unsafe to generalize from the results obtained with either class of apples. It is hoped in our work of next season we shall be able to secure valuable data on this point.

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* Bulletin 7, Iowa Experiment Station, 277.

In general it is safe to say the proper time for the first application is just after the fruit has formed; and for the second, some two or three weeks later. In no case should any spraying be done while the trees are in blossom. It is too early to be of any value whatever in checking the work of the codling larvæ, and very serious damage may be done in poisoning the bees, which are very abundant at that season.

7. *Work in Other States.* As early as 1880, Professor A. J. Cook, of the Michigan Agricultural College, commenced the use of the arsenites in combatting the codling moth and other orchard pests. He has been an earnest advocate of spraying ever since, and has done much to bring the practise into popular favor in the West.

Professor E. S. Goff in 1884, conducted a series of experiments at the New York Agricultural Experiment Station, in which he found that 69 per cent. of injury was prevented by the use of Paris green. Similar results were obtained by Dr. S. A. Forbes, of Illinois, in 1885.

In 1889, Professor C. P. Gillette sprayed four Duchess trees with London purple, taking four contiguous trees as checks. "At the end of the season it was found that the treated trees had 68 per cent. less of wormy fruit than those not treated."*

Professor Gillette also tried a new method of applying poison to the trees. His method was the same as that used by many farmers in treating potato vines for the Colorado beetle, *i. e.* mix 1 pound Paris green with 100 pounds land plaster and throw the mixture over the trees when the dew is on. This method is of course impracticable for use in a large orchard, and is suggested only as a possible expedient for saving the fruit on a few trees about the house.

Professor Beckwith (Bul. XII, Del. Exp. Sta.) found that: "The percentage of wormy fruit from trees sprayed with either London purple or Paris green was from 18 to 35 per cent. less than from trees not sprayed. The greatest benefit was obtained when the trees were sprayed three times, using the mixture at the rate of 1 pound to 200 gallons of water."

These results are at variance with those obtained by Gillette, who found that: "There was practically no difference between once and twice spraying;" and "No. 7, which was treated late,

* Bulletin 7, Iowa Experiment Station.

was about as well protected as any."* It is probable that this disagreement is due, as before suggested, to the character of the varieties used in the trial.

From the experiments of Cook† and Bailey‡ the conclusion is reached that Paris green is much less liable to injure the foliage than is London purple. London purple is exceedingly variable in composition, and frequently contains large amounts of soluble arsenic—in some cases as much as 40 per cent. The presence of soluble arsenic is specially dangerous to foliage.

Summary.

1. All sprayed trees had a smaller percentage of wormy fruit than did the unsprayed.

2. A mixture of one pound Paris green in 250 gallons water gave better results than did a weaker mixture; but

3. A mixture of 1 pound to 320 gallons, applied once, saved a large percentage of the fruit.

4. The number of windfalls was greatly lessened by spraying.

5. The proportion of wormy fruit among the windfalls was much smaller from the sprayed trees.

6. A large proportion of the wormy fruits from sprayed trees is entered from the side or base, while in fruits from unsprayed trees, the entrances at the calyx are largely in excess.

7. There is no danger from the use of fruit which has been sprayed as directed.

8. The best time to spray probably varies with different varieties, but in no case should any trees be sprayed before the blossoms fall.

9. The difference in the opinions of experimenters as to the proper time for spraying, is probably due to well known characteristics of different varieties.

10. There is greater liability to injury of foliage from the use of London purple than from the use of Paris green.

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* Bulletin 7, Iowa Experiment Station.

† Bulletin 53, Michigan Experiment Station.

‡ Bulletin 18, Cornell University Experiment Station.

II, Apple Scab, (*Fusicladium dendriticum.*)

It is not within the province of the writer to discuss in detail the characteristics of fungi injurious to fruits; but as no description of the disease known as *apple scab* has heretofore been published in the reports of the Experiment Station, it may be well to call attention, in a general way, to the nature of this disease.

All are familiar with the dark colored spots or scabs which appear on some varieties of apples,—notably the Fameuse, the Maiden Blush, and the Baldwin. These spots represent but one stage in the life history of a plant which grows on, and obtains its nourishment from the apple. In other words, apple scab is caused by the attack of a parisitic fungus—*Fusicladium dendriticum.* Its attack is not always confined to the fruit, and it is sometimes the cause of very serious loss to the orchardist.

The plant is reproduced by means of *spores*,* which are carried by the wind, and vegetate under favorable conditions. The most vigorous growth is made during cool, moist seasons. The climate of this state seems specially favorable for the growth of the fungus.

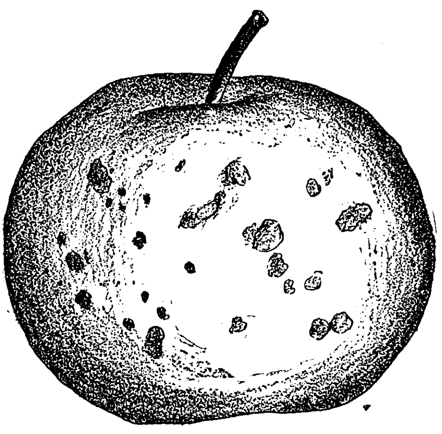

Fig. 1. A Diseased Apple.

Figure 1 represents the disease as it appears on the fruit. In badly affected specimens the scabby spots are much larger and often cause the apple to crack. The nourishment is all taken from the affected side, and in consequence the fruit is deformed. If the fruits are very young when attacked, they usually wither and fall.

The fungus attacks the leaves and young growing twigs as well as the fruit. If the attack occurs early in the season and is severe, much damage may

* The appearance of these spores is illustrated in the report of the Maine Experiment Station for 1889, page 182.

result. The vitality of the tree is lessened, and the effects are accumulative, thus reducing the possibilities of future crops.

Figure 2 Scab Spots on a Leaf.

The disease first appears on the leaves as brownish or olive-colored spots, as shown in figure 2. These spots, if numerous, run together and finally become blackish, and the leaf tissue dies. The effect on young foliage, attacked early in the season, is well shown in figure 3.* The cut is from a photograph taken in August and shows, on the left, a full sized leaf which developed after the first attack of the fungus. If the attack occurs later in the season, after the year's growth is nearly completed, but little injury is wrought.

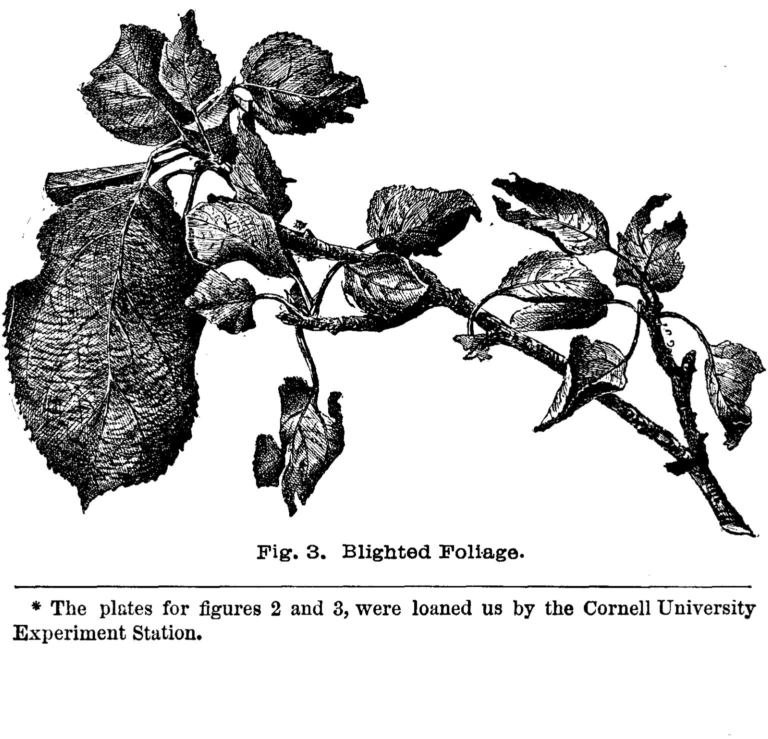

Fig. 3. Blighted Foliage.

* The plates for figures 2 and 3, were loaned us by the Cornell University Experiment Station.

Results of Spraying.

For several seasons past, experiments have been conducted in various states for the purpose of determining a successful method of controlling the apple scab fungus. It has been found that in many instances much benefit is derived from the use of solutions of some of the compounds of copper.

During the past season a series of experiments was planned with the purpose in view of determining on an extended scale the effectiveness of certain mixtures, and some of the problems relative to methods of application. The latter and most extensive portion of the work was carried on in the orchard of F. M. Woodward of Winthrop, the work being conducted by Mr. C. E. Moore, under the direction of the writer. Owing to local conditions, most of the problems under consideration remain unsolved. Much credit is due Mr. Moore, however, for the faithfulness with which he attended to the spraying. The work will be continued next season.

The first part of the work, that of determining the effectiveness of certain compounds, was carried on in the orchards of Mr. Charles S. Pope, of Manchester, and the results were eminently satisfactory. Fifty-nine Baldwin trees were sprayed with various mixtures, and a suitable number was left to serve as checks. The trees were of medium size and bore from one and one-half to three barrels of fruit. The time at command when the fruit was gathered was so limited that all of the trees could not be examined critically; but a sufficient number was examined to give a fair basis for our conclusions.

In gathering the fruit, except where the whole was taken, about two and one-half bushels were taken at random from all parts of each tree, the plan being to get a fair average of the fruit. The baskets were filled from the lower limbs on all sides of the tree; then from the branches at the height of a man's head; then higher, and finally in the very top.

Four different solutions were used:

A.—A modified form of *eau celeste*.

B.—Ammoniacal solution of copper carbonate, using 3 ounces copper carbonate, 1 quart ammonia, and 30 gallons water.

C.—Same as B, except that but 2 ounces of copper carbonate was used.

D.—Copper carbonate in suspension—2 ounces copper carbonate in 25 gallons water.

The unsprayed trees were so distributed as to serve as checks for more than one solution.

The accompanying table gives a comprehensive view of the results obtained.

TABLE VII.—*Effects of Copper Solution on Apple Scab.*

Solution used.	Number fruits examined.	Free from scab.	Slightly scabby.	Badly scabbed.	Worthless.	Per cent. free.	Per cent. "No. 1" fruit (as regards scab).	Remarks.
A.								
	383	231	52	78	22	60.3	73.9	
	264	138	85	33	8	52.3	84.5	
	441	160	193	74	14	36.3	80.0	
	473	276	121	66	10	58.4	83.9	
	732	504	189	34	5	68.9	94.7	
Average per tree	**459**	**262**	**125**	**57**	**12**	57.0	85.0	
B.								
	972	318	524	120	10	32.7	86.7	
	780	463	262	48	7	59.4	92.9	
	541	278	226	37	0	51.4	93.1	
	918	471	345	94	8	51.3	88.9	
Average	**802**	**383**	**339**	**78**	**6**	47.8	90.0	
C.								About three-fourths of the fruits classed as slightly scabby were better fruits than those free from attack.
	936	271	506	149	10	28.9	83.0	
	734	200	391	129	14	27.3	80.5	
	490	239	196	50	5	48.8	88.9	
Average	**720**	**237**	**364**	**109**	**10**	32.9	83.5	
D.								
	669	15	148	329	177	2.2	24.4	Sprayed 3 times: May 22, June 15, July 28.
	484	18	146	233	87	3.7	33.9	
	653	42	147	299	165	6.4	28.9	Sprayed once, May 22.
	488	20	112	252	104	4.1	27.0	
Average	**576**	**24**	**138**	**278**	**133**	4.1	28.1	
CHECKS.								
	526	10	135	205	176	1.9	27.5	
	1046	23	156	508	359	2.2	17.1	
	615	58	179	283	95	9.4	38.5	
Average	**729**	**30**	**157**	**332**	**210**	4.1	25.6	

The table appears somewhat formidable, but the figures are significant. There was in every instance save one,—solution D,—a marked difference in the amount of scab on sprayed and unsprayed trees.

The highest per cent. of fruit free from scab was obtained from the use of the *eau celeste*, the gain being 52.9 per cent. or more than half the crop. The greatest actual gain, in the quantity of marketable fruit, however, was obtained from the use of the stronger solution of copper carbonate. The actual increase of

No. 1 fruit over the amount on unsprayed trees, in this case amounted to nearly 65 per cent. A closer comparison of the results with the different solutions is not made, because of a lack of uniformity in time of application.

The results obtained from the use of solution D—copper carbonate in suspension, will not warrant us in advising the use of that mixture. Our results from the use of this mixture are directly opposed to those obtained at some other experiment stations. At the Central Experiment Farm of Canada, Mr. Craig found the use of copper carbonate in suspension to make a difference of 26 per cent. in the number of fruits of the first quality, while the ammoniacal solution gave an increase of only 9 per cent.* In our work, as will be seen from the above table, there was *no* increase in the number of perfect fruits in the case of trees sprayed with solution "D," as opposed to an increase of 43.6 per cent. on trees sprayed with "B"—the ammoniacal solution. It will also be observed, that repeated applications of the mixture were of no value. The per cent. of fruit entirely free from scab, was actually higher on trees sprayed but once than on those sprayed three times.

The effect of the treatment with solutions A and B was even more marked in another of Mr. Pope's orchards. This orchard, which has been set about forty years, is located on a hillside with northwestern aspect. The orchard was used as a pasture for hogs, and the trees were growing vigorously.

Alternate rows were sprayed with solution A, the application being made May 11, before the buds opened, and June 19. The results were sufficiently marked so that it was possible to go into the middle of the orchard and determine which were the sprayed and which the unsprayed rows, from the general appearance of the trees.

Some of the trees in the check rows were sprayed May 22, and June 22 with solution B, the results being nearly as satisfactory as obtained with solution A. The fruit from four trees standing in immediate proximity to each other, was counted with the result shown in the table.

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* Cf. Bul. 10, Central Exp. Farm.

Treatment.	No. fruits examined.	Free from scab.	Slightly scabby.	Badly scabbed.	Worthless.	Per cent. free.	Per cent. No. 1 apples (as regards scab).	Remarks.
Solution A.	414	247	145	22	0	59.7	94 7	Sprayed twice,—May 11 and June 19.
Solution B.	461	133	232	91	5	28.9	79.2	Sprayed twice,—May 22 and June 22.
Check.....	474	35	191	219	29	7.4	47.6	Not sprayed.
Check.....	430	45	196	163	26	10.4	56.0	" "

It will be noticed that there is a decided difference between the unsprayed trees and the trees sprayed with either solution. The least difference, that between the best check tree and the tree sprayed with copper carbonate, was 18.5 per cent. of fruit absolutely free from scab, and 23.2 per cent. of fruit which would be classed as "No. 1."

It will also be observed, that in this instance the *eau celeste* gave better results than did the copper carbonate in an orchard where the efficiency of both might well be tried. Definite conclusions should not be drawn from results obtained with so few trees; but it may be seen that the results correspond very nearly to those in the first table. The per cent. of fruits absolutely free from scab is much larger on the tree sprayed with *eau celeste*, while those but slightly attacked preponderate on the other; thus bringing the percentage of salable fruits up well toward the first.

When it is considered that the cost of spraying a single tree is only about *three* cents for each application, the figures given above are very significant.

As before stated, most of the work in Mr. Moore's orchard, where methods of application and the merits of different solutions were under study, was of no value. A few trees in an old orchard near the house were sprayed in such a manner, however, that it is possible to get some idea of the relative value of spraying. The treatment was not continued during the season, as the trees were not included in the original plan of the experiment.

Two rows in an orchard perhaps forty years old, were sprayed on May 21, and June 12, with carbonate of copper in suspension—2 ounces to 30 gallons water—and Paris green, 1 pound to 250 gallons. In an adjacent row, the trees were sprayed once, June 15, with the ammoniacal solution—solution A. As seen in

Table VII, trees sprayed with copper carbonate in suspension were little better than unsprayed trees, and for comparison they may be regarded as checks.

The fruit from several trees was examined, with the following result:

	No. fruits examined.	Free from scab.	Slightly scabby.	Badly scabbed.	Worthless.	Per cent. free.	Per cent. No. 1 fruit.	
Copper carbonate in suspension, (check)....	492	3	123	257	108	.6	25.6	Average of three trees.
Ammoniacal solution of copper carbonate...	556	19	184	264	86	3.4	36.5	Average of two trees.

In another part of the same orchard two contiguous trees were examined with very similar results.

As will be seen at a glance, this orchard suffered very severely. Some trees were absolutely without a perfect fruit, and the average amount of fruit that would pass as No. 1, was but little more than one-fourth of the crop. The difference between sprayed and unsprayed trees is not very marked, but the figures point to the fact that there are uniformly beneficial results, even from limited applications.

An exception to the last statement may be noted in the case of a single tree in Mr. Pope's orchard. This tree was sprayed three times with *eau celeste*, the last application being made July 28. The amount of scabby fruit was slightly in excess of the average amount on unsprayed trees. The only explanation we can offer is that the leaves fell very badly, and the tree was less able to withstand the attack of the fungus late in the season. Any plant of weakened vitality is more subject to disease than is one of vigorous constitution.

How to Prepare the Mixtures.

Directions for preparing the modified *eau celeste*, and the ammoniacal solution of copper carbonate, as used at other experiment stations, were given in the report of this station for 1889. It may be well, however, to refer to the subject in the present connection.

Solution A.—Modified Eau Celeste.

Dissolve 2 pounds sulphate of copper, ("Blue stone"), in 2 gallons hot water. In another vessel dissolve 2 1-2 pounds carbonate of soda (sal soda); mix the two solutions, and, when ready for use, add 1 1-2 pints strong ammonia water and dilute the whole to 28 gallons. The sulphate of copper should be dissolved in a *wooden* vessel as zinc or iron will corrode.

It is well to make the stock solution at least one day before it is wanted for use, and to mix a considerable quantity, merely observing the proportions suggested.

Solution B.—Ammoniacal Solution of Copper Carbonate.

The formula used in most of our work was as follows:

3 oz. copper carbonate.
1 qt. ammonia.
30 gal. water.

Dissolve the carbonate of copper in the ammonia and when ready for use add to the required amount of water. As with the *eau celeste*, the solution should be made several hours before desired for use.

The ammonia used in our work was nearly 26° Baumé (sp. grav. ——); and in some instances the foliage was injured. In the later applications the solution was diluted to 35 gallons, and it is probable that 40 gallons would be better.

It was found that only about 1 1-2 ounces of the copper carbonate would dissolve in one quart of ammonia; still better results were obtained from the use of the 3 ounces than from solution C, in which only 2 ounces copper was used in a quart of ammonia. Why this is so is not clear, since the simple copper carbonate in suspension appeared to have no value.

An improved formula for the ammonio-copper carbonate solution has been recommended. It is as follows:

3 oz. carbonate of copper.
1 lb. carbonate of ammonia.
50 gal. water.

Mix the carbonate of copper and the carbonate of ammonia thoroughly, and dissolve the mixture in two quarts of hot water. This solution may then be added to the full amount of water; or a considerable quantity may be prepared and used as a stock solution.

Solution D, copper carbonate in suspension, is not a true solution, as the copper carbonate is not soluble in water. It is made by adding a given amount of the copper salt to the water and, as in the case of Paris green, the particles are held in suspension by continual agitation. This mixture is not recommended for general use.

Where to Procure the Chemicals.

The ingredients of the modified *eau celeste*, may all be obtained at any local drug store. If any considerable quantity is to be used, however, it is much cheaper to send to some reliable wholesale house and buy in bulk. For this reason it is well for farmers to club together in securing a supply of chemicals. Carbonate of copper is not usually handled by local dealers, and in ordering, it is well to specify that the *precipitated* form is desired.

The following firms are named as reliable parties who will supply the various materials at a reasonable cost:

Weeks & Potter Co., Washington street, Boston.

Eimer & Amend, 205 Third Avenue, New York.

W. S. Powell & Co., 202 Bowley's Wharf, Baltimore, Md.

Some dealers offer the ammoniated copper carbonate, "copperdine," ready for use by diluting with the proper amount of water. In this way less labor is required in preparation, but the ingredients are much more costly.

Summary.

1. Apple scab is caused by the attack of a parasitic plant—a fungus.

2. The fungus attacks the leaves and young twigs, as well as the fruit, and may seriously injure the tree.

3. The attack is most severe in cool, moist seasons.

4. Spraying with certain compounds of copper will hold the fungus in check.

5. In some cases the amount of No. 1 fruit on the sprayed trees exceeded that on unsprayed trees by 65 per cent. while the average increase of salable fruit was more than 50 per cent.

6. There appears to be little difference in effectiveness between the ammoniacal solution of copper carbonate, and modified eau celeste.

7. Three ounces copper carbonate dissolved in one quart ammonia gave better results than did a smaller proportion.

8. Carbonate of copper in suspension appears to be of no value as a fungicide.

9. The cost of spraying with eau celeste or the ammoniacal solution of copper carbonate, is about three cents per tree for each application.

III, Spraying Apparatus.

In the report of the Experiment Station for 1889, may be found figures and descriptions of several desirable force pumps and spraying nozzles. In addition to those there enumerated, we have used several others with which we are well pleased.

Fig. 4.
"Perfection" Spraying Outfit.

Figure 4 represents the "Perfection" outfit. This is the pump we have used in most of our field work. The pump is supplied with about ten feet of hose, and also has a second discharge pipe returning to the bottom of the barrel, thus keeping the mixture agitated. The cost of the pump with brass cylinder and plunger is $11.50. It is manufactured by the Field Force Pump Co., Lockport, N. Y. Other pumps of a similar style may be obtained of the Gould Manufacturing Co., Seneca Falls, N. Y., also of Rumsey & Co., of the same place.

In large orchards it is no small task to work the pump by hand and there is a demand on the part of owners of such orchards for a labor-saving device. To meet this demand, several styles of pumps with automatic gearing, have been constructed. One of these, the "Victor," made by the same company as the "Perfection" outfit, is shown in figure 5.

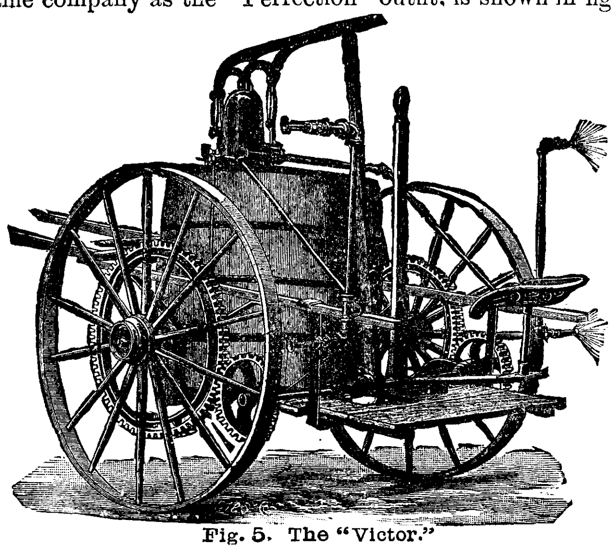


Fig. 5. The "Victor."

At a relatively small expense any of the hand pumps may be made to work automatically. Get a casting similar to that used on a hay tedder, with a small wheel to match, and with a bent crank-shaft the motion may readily be transmitted to the handle of the pump.

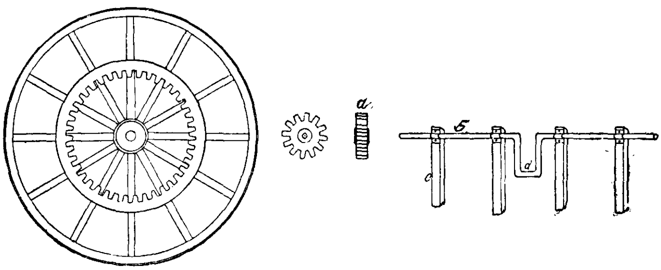


Fig. 6.

The accompanying sketch, figure 6, illustrates the method. The small wheel, *a*, works inside of the large cog-wheel. The crank shaft, *b*, is held firmly in place at the rear of the cart by the iron or wooden supports, *c*. The handle of the pump is connected with the crank shaft at *d* by means of a wooden rod. This method has been used to some extent, but I am not aware that it is patented.

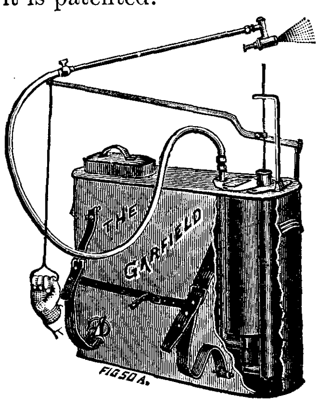


Fig. 7.

For shrubs, or low growing trees, one of the various knapsack sprayers will be found useful. Figure 7 represents the form made by the Field Force Pump Co., at a cost of $14.00. There are several other pumps not greatly unlike this, which sell at about the same price. The *Eureka*, manufactured by Adamson & Son, Washington, D. C., is an excellent pump, but is more expensive than the others, costing $21.00. The knapsack sprayers are specially valuable in the small fruit, and vegetable gardens, for spraying currant bushes or potato vines.

We have not succeeded in finding a nozzle more satisfactory for general purposes than the *Climax*, manufactured by the Nixon Nozzle & Machine Co., Dayton, Ohio. This nozzle is specially valuable in the application of Paris green, when fineness of spray is the great desideratum. It has been suggested that a battery of these nozzles leading from a common chamber, would be an improvement over the present form. The aperture is so small in the form now in use, that too much time is lost in applying the liquid.

The "graduated spray" nozzle, which goes with the Perfection outfit, is good when accurately made, but if the central column is not quite true, the spray is uneven. This nozzle requires heavy pressure to give a satisfactory spray.

The knapsack sprayers are usually supplied with the vermorel nozzel, the form of which may be seen in figure 7.

GENERAL SUMMARY.

1. The work of the Horticultural Department during the past year has been largely in the way of organization.

2. The principal lines of investigation are in the study of the effects of climate on plant variation; effects of pollination; studies of the egg plant and the pepino; the amelioration of native fruits by selection and crossing; methods of culture of certain garden vegetables in the field and under glass; methods of combating orchard pests.

3. Experiments in the culture of cabbages show that the best results are obtained by frequent transplanting; that in general, depth of setting has little influence on the size of the heads; that disturbing the roots in transplanting has no marked effect on size of head or time of maturity.

4. Experiments with tomatoes show that frequent handling makes plants stocky; that early setting is advisable; that trimming the plants is an effective method of hastening maturity and increasing yield.

5. Egg plants may be successfully grown in this region by starting the plants early, and giving them rich soil and thorough cultivation.

6. The collection of fruits on the grounds of the experiment Station has been materially increased, but special attention is being given to developing varieties suited to the more trying localities of the state.

7. As a result of spraying apple trees with Paris green, it was found that all sprayed trees had less wormy fruit

than did the unsprayed trees; that the number of windfalls was greatly lessened by spraying; that the best time to spray probably varies with different varieties, but in no case should spraying be done before the blossoms fall. There is no danger from the use of fruit which has been sprayed as directed.

8. Spraying with the ammoniacal solution of copper carbonate, or with the modified *eau celeste*, is effective in checking the ravages of the apple scab fungus; but copper carbonate in suspension appears to have no value as a fungicide. The cost of spraying with *eau celeste* or with the ammoniacal solution of copper carbonate is about three cents per tree, for each application.

FERTILIZER EXPERIMENTS.

PROF. WALTER BALENTINE.

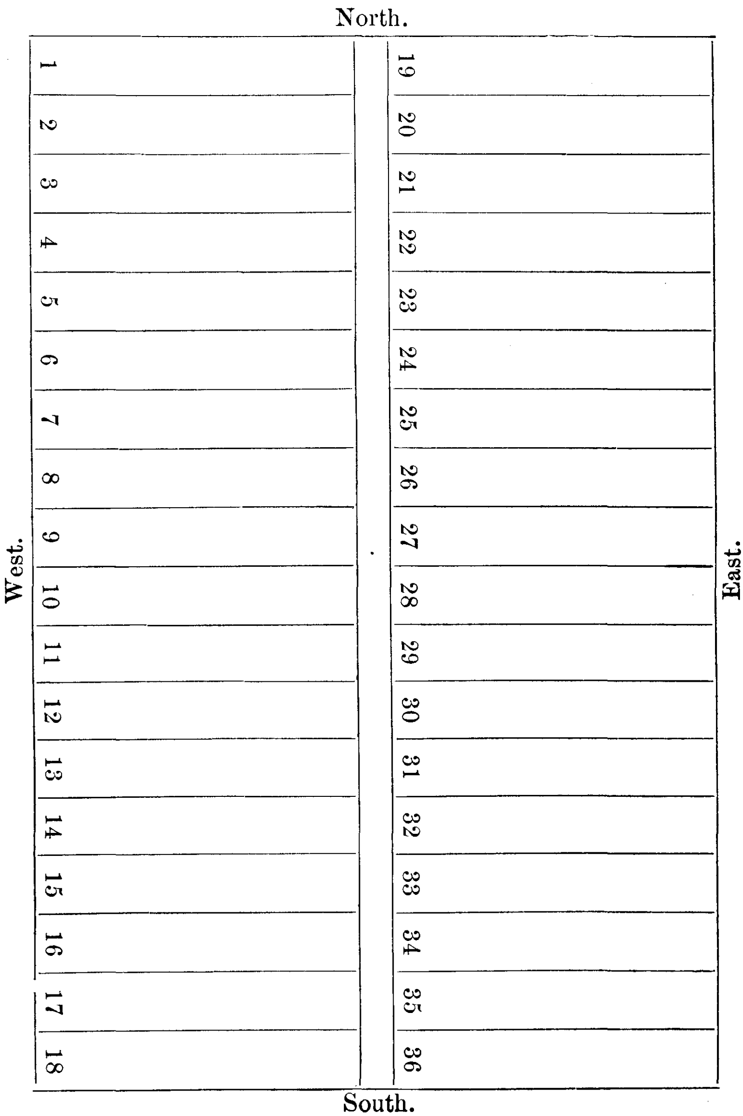
EFFECT OF DIFFERENT FORMS AND MIXTURES OF FERTILIZERS.

For the past six years the Station has been engaged continuously on the same land, with experiments, having for their object (1) The comparative effect of different forms of phosphoric acid in manuring crops; (2) A comparison between commercial fertilizers and stable manure in crop production; (3) The effect of a partial and complete fertilizer; (4) A comparison of the effect of different quantities of fertilizers.

The results of this work have been published from time to time in the Station Reports. Each year adds a little to the interest and value of the data obtained and the writer ventures to give, in connection with the report of the experiments of this year a review of those of preceding years.

The soil, or the field on which these experiments were carried out, was in condition to produce a fair crop of hay or grain, when the work was commenced. Thirty-six one-twentieth acre plots were laid off and numbered as indicated in the accompanying diagram of Experiment Field, No. 1.

DIAGRAM OF EXPERIMENTAL FIELD NO. 1.



In 1886, 1887 and 1889 the plots were treated as indicated in the following table, on each of the three years, so that the total amount of fertilizers applied during the six years that this field has been cultivated experimentally is three times the amounts given in the table, no fertilizer being applied in 1888, 1890 and 1891.

Plot 1, " 7, " 13	Received no fertilizer.
Plot 2, " 8, " 14	Dissolved bone black, 400 lbs. per acre. Muriate of potash, 100 " " " Sulphate of ammonia, 200 " " "
Plot 3, " 9, " 15	Fine ground bone, 360 lbs. per acre. Muriate of potash, 100 " " " Sulphate of ammonia, 140 " " "
Plot 4, " 10, " 16	Fine ground South Carolina rock, 300 lbs. per acre. Muriate of potash, 100 lbs. per acre. Sulphate of ammonia, 200 lbs. per acre.
Plot 5, " 11, " 17	Muriate of potash, 100 lbs. per acre. Sulphate of ammonia, 200 lbs. per acre.
Plot 6, " 12, " 18	Stable manure, 40,000 lbs. per acre.
Plot 19, " 25, " 31	Received no fertilizer.
Plot 20, " 26, " 32	Dissolved bone black, 400 lbs. per acre.
Plot 21, " 27, " 33	Dissolved bone black, 400 lbs. per acre. Muriate of potash, 100 " " "
Plot 22, " 28, " 34	Dissolved bone black, 200 lbs. per acre. Muriate of potash, 50 " " " Sulphate of ammonia, 60 " " "
Plot 23, " 29, " 35	Dissolved bone black, 300 lbs. per acre. Muriate of potash, 100 " " " Sulphate of ammonia, 120 " " "
Plot 24, " 30, " 36	Dissolved bone black, 400 lbs. per acre. Muriate of potash, 150 " " " Sulphate of ammonia. 180 " " "

In 1886 and 1887, the field was cropped with oats, in 1888 with grass. In 1889 the land was fallow. In 1890, a crop of peas was taken off and 1891 another crop of oats.

Comparative Effect of Different Forms of Phosphoric Acid.

Included in the tables showing the results of experimental work in this direction, are a set of plots that have been cultivated without manure, a set manured with stable manure from cows, and a set manured with muriate of potash and sulphate of ammonia. The three sets of plots which have been furnished phosphoric acid have been treated like the last named set with the addition of the phosphates.

Table A gives the yields per plot and the average yield per plot for the present year.

Table B shows the average yield per acre, the gains of the manured plots over the unmanured plots, and the gain per acre of the plots manured with phosphates, muriate of potash and sulphate of ammonia over those manured with muriate of potash and sulphate of ammonia alone.

Table C gives the yields for each year and the total yields of each crop.

TABLE A.

	No Manure.		Dissolved Bone Black 400 lbs., Muriate of Potash 100 lbs., and Sulphate of Ammonia 200 lbs. per acre, in 1886, 1887, and 1889.		Fine Ground Bone 300 lbs., Muriate of Potash 100 lbs., and Sulphate of Ammonia 140 lbs. per acre, in 1886, 1887, and 1889.		Fine Ground South Carolina Rock 300 lbs., Muriate of Potash 100 lbs., and Sulphate of Ammonia 200 lbs. per acre, in 1886, 1887, and 1889.		Muriate of Potash 100 lbs., and Sulphate of Ammonia 200 lbs. per acre, in 1886, 1887, and 1889.		Stable Manure 40,000 lbs. per acre in 1886, 1887, and 1889.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
Plot 1	75.5 lbs.	59.5 lbs.										
" 7	50.0 "	25.0 "										
" 13	50.0 "	25.0 "										
" 2			73 0 lbs.	67.0 lbs.								
" 8			66.0 "	39.0 "								
" 14			63.0 "	42.0 "								
" 3					68.5 lbs.	71.5 lbs.						
" 9					67.3 "	32.7 "						
" 15					70.7 "	59.2 "						
" 4							58.5 lbs.	41.5 lbs.				
" 10							53.7 "	36.3 "				
" 16							61.5 "	38.5 "				
" 5									58.0 lbs.	47.0 lbs.		
" 11									59.5 "	20.5 "		
" 17									77.0 "	38.0 "		
" 6											75.3 lbs.	74.8 lbs.
" 12											87.0 "	58.0 "
" 18											71.0 "	129.0 "
Average	58.3 lbs.	36.3 lbs.	67.3 lbs.	49.3 lbs.	68.8 lbs.	54.5 lbs.	58.0 lbs.	38.8 lbs.	64.8 lbs.	35 2 lbs.	77.1 lbs.	87.3 lbs.

TABLE B.

	Fertilizers per acre for the years 1886, 1887, and 1889, in lbs.	Average yield per acre of oats, in bushels.	Average yield per acre of straw, in lbs.	Av'ge increase of grain of manured plots over unmanured plots per acre, in bushels.	Av'ge inc. of grain per acre in bu., of plots receiving phosphoric acid with potash & nitrogen, over those receiving only potash & nitrogen.
No manure		38.9	728		
Dissolved bone black	400				
Muriate of potash	100	44.9	986	6.0	1.7
Sulphate of ammonia	200				
Fine ground bone	3 0				
Muriate of potash	100	45.9	1090	7.0	2.7
Sulphate of ammonia	140				
Fine ground S. C. rock	3 0				
Muriate of potash	100	38.7	776	—0.2	—4.5
Sulphate of ammonia	200				
Muriate of potash	100	43.2	704	4.3	
Sulphate of ammonia	200				
Stable manure	40,000	51.4	1746	12.5	

TABLE C.

	No Manure.	Dissolved Bone-black 400 lbs., Muriate of Potash 100 lbs., and Sulphate of Ammonia 200 lbs. per acre, in 1886, 1887, and 1889.	Fine Ground Bone 300 lbs., Muriate of Potash 100 lbs., and Sulphate of Ammonia 140 lbs. per acre, in 1886, 1887, and 1889.	Fine Ground South Carolina Rock 300 lbs., Muriate of Potash 100 lbs., Sulphate of Ammonia 200 lbs. per acre, in 1886, 1887, and 1889.	Muriate of Potash 100 lbs., and Sulphate of Ammonia 200 lbs. per acre, in 1886, 1887, and 1889.	Stable Manure 40,000 lbs. per acre, in 1886, 1887, and 1889.
	Yield per acre.	Yield per acre.	Yield per acre.	Yield per acre.	Yield per acre.	Yield per acre.
Oats, 1886	55.7 bush. of 30 lbs,	82.9 bush. of 30 lbs.	76.2 bush. of 30 lbs.	72.2 bush. of 30 lbs.	64.5 bush. of 30 lbs.	73.9 bush. of 30 lbs.
Oats, 1887	26.7 " "	38.7 " "	31.9 " "	35.5 " "	35.1 " "	34.7 " "
Hay, 1888	2566 lbs.	2434 lbs.	2800 lbs.	2566 lbs.	2234 lbs.	4010 lbs.
Fallow, 1889	....	....	....	....	....	....
Peas, 1890	12.3 bush. of 60 lbs.	15.0 bush. of 60 lbs.	15.7 bush. of 60 lbs.	14.3 bush. of 60 lbs.	12.7 bush. of 60 lbs.	22.7 bush. of 60 lbs.
Oats, 1891	38.9 " 30 lbs.	44.9 " 30 lbs.	45.9 " 30 lbs.	38 7 " 30 lbs.	43.2 " 30 lbs.	51.4 " 30 lbs.
Total crop in 6 years.						
Oats	121.3 bushels.	166.5 bushels.	154.0 bushels.	146.4 bushels.	142.8 bushels.	160.0 bushels.
Hay	2566 lbs.	2434 lbs.	2800 lbs.	2566 lbs.	2234 lbs.	4010 lbs.
Peas	12.3 bushels.	15.0 bushels	15.7 bushels.	14.3 bushels.	12.7 bushels.	22.7 bushels.

An examination of table A shows that the set of plots which has been cultivated for six years without manure has yielded the present year 38.9 bushels of oats.

The following three sets of plots have each received during the six years three applications of what is called a complete fertilizer, that is, a fertilizer containing phosphoric acid, potash and nitrogen. The only difference in the treatment of the three sets of plots being that the source of phosphoric acid in the first set was dissolved bone black, in the second fine ground bone, and in the third fine ground South Carolina rock. This year's crop shows but little difference between the effectiveness of the phosphoric acid from dissolved bone black and fine ground bone. It should be remembered, however, that this crop was grown two years after the last application of the fertilizers and the soluble phosphoric acid of the dissolved bone black had, without doubt, reverted.

Little can be said in regard to the crop produced with South Carolina rock as a source of phosphoric acid. These plots gave a crop which was no greater than that obtained on the unmanured plots, and was less than was obtained on plots manured with muriate of potash and sulphate of ammonia with no South Carolina rock.

No explanation is known for this variation in the crop of the South Carolina rock plots, from what might have been expected.

The product on the plots manured with commercial fertilizers was unsatisfactory, considering the treatment they had received in the way of fertilizers.

Table C furnishes the data for studying the effect of the phosphoric acid from different sources through the six years since the experiment was commenced. Dissolved bone black gives the largest total yield of oats, the second largest yield of peas and the smallest yield of hay. Fine ground bone has given the largest yield of hay and peas and the second largest yield of oats. The South Carolina rock is second in yield of hay and third in yield of oats and peas.

The plots manured with commercial fertilizers gave large yields the first year of the experiment, two sets even exceeding the yield of the stable manure plots. The second year of the experiment the weather was unfavorable and the yield on all plots was light. The stable manure has, however, with the exception of that year, given uniformly good crops, while those upon which commercial fertilizers were used have not produced what could be called a paying crop since the first year. The question naturally arises, why did we obtain so good results the first year with commercial fertilizer and such indifferent results in subsequent years. Many farmers who have tried to run a field with commercial fertilizers alone for a series of years have been confronted with the same facts that are encountered here.

The experiments do not furnish the data for a definite answer but attention is called to certain facts in connection with the history of this field. At the first plowing there was a heavy sod turned under which insured a first class mechanical condition of the soil for the crop that followed. Since that time, although grass has been produced on the field one season, no crop has been grown on sod as the ground was fallow the year following the grass crop. On the plots manured with stable manure large amounts of organic matter have been supplied in the manure which, on a stiff clay loam like the soil in the experiment, insures a better mechanical condition for the growth of crops.

SUMMARY.

(1.) **On sod land all of the phosphates used in the experiment have been effective.**

(2.) **With oats, dissolved bone black has produced on the average the largest crop.**

(3.) **With peas and hay there has been but little difference in the effectiveness of the three phosphates used:**

The Effect of a Partial and Complete Fertilizer.

The object of this experiment is to determine the needs of the soil of the College Farm and the special need of different crops on that soil.

The ordinary definition of a complete fertilizer is, one that furnishes all three of the elements which are most likely to be deficient in the soil, namely, potash, phosphoric acid and nitrogen. A partial fertilizer is one from which one or two of the above named elements are omitted. It is in this sense that the terms partial and complete fertilizers are used.

Table D shows the quantity of oats produced the present year on unmanured plots, on plots manured with muriate of potash and sulphate of ammonia, on plots manured with dissolved bone black, on plots manured with dissolved bone black and muriate of potash, and two sets manured with complete fertilizers. Table E gives the average yields per acre of the same and the gains per acre of the manured plots over the unmanured plots. Table F gives the average yields for each year and the total yields of the different crops for the period of six years.

TABLE D.

	No Manure.		Muriate of Potash 100 lbs. and Sulphate of Ammonia 200 lbs. per acre in 1886, 1887, and 1889.		Dissolved Bone-black 400 lbs. per acre, in 1886, 1887, and 1889.		Dissolved Bone-black 400 lbs., Muriate of Potash 100 lbs. per acre, in 1886, 1887, and 1889.		Dissolved Bone-black 400 lbs., Muriate of Potash 100 lbs., and Sulphate of Ammonia 200 lbs. per acre, in 1886, 1887, and 1889.		Dissolved Bone-black 400 lbs., Muriate of Potash 150 lbs., and Sulphate of Ammonia 180 lbs. per acre, in 1886, 1887, and 1889.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
Plot 1	75.5 lbs.	59.5 lbs.										
" 7	50.0 "	25.0 "										
" 13	50.0 "	25.0 "										
" 19	69 0 "	61.0 "										
" 25	55.0 "	50.0 "										
" 31	54.8 "	20.3 "										
" 5			58.0 lbs.	47.0 lbs.								
" 11			59.5 "	20.5 "								
" 17			77.0 "	38.0 "								
" 20					62.0 lbs.	78.0 lbs.						
" 26					64.0 "	66.0 "						
" 32					62 5 "	67.5 "						
" 21							53.0 lbs.	67 0 lbs.				
" 27							60.0 "	65.0 "				
" 33							76.5 "	78.5 "				
" 2									73.0 lbs.	67.0 lbs.		
" 8									66.0 "	39.0 "		
" 14									63.0 "	42.0 "		
" 24											60.0 lbs.	70.0 lbs.
" 30											63.0 "	67.0 "
" 36											68.8 "	71.2 "
Average	57.0 lbs.	40.1 lbs.	61.5 lbs.	35.2 lbs.	62.8 lbs.	70.5 lbs.	63.2 lbs.	70.2 lbs.	67.3 lbs	69.3 lbs.	53.9 lbs.	69.4 lbs.

TABLE E.

	Fertilizers per acre in 1886, 1887, and 1889.	Yield of Oats per acre, in bushels.	Yield of Straw per acre, in lbs.	Increase of grain in bush., of manured plots over unmanured plots.
No manure		38.0	802	
Muriate of potash	100 lbs.	41.0	704	3.0
Sulphate of ammonia	200 "			
Dissolved bone-black	400 "	41.2	1410	3.2
Dissolved bone-black	400 "	42.1	1404	4.1
Muriate of potash	100 "			
Dissolved bone-black	400 "			
Muriate of potash	100 "	44.9	1316	6.9
Sulphate of ammonia	200 "			
Dissolved bone-black	400 "			
Muriate of potash	150 "	42.6	1388	4.6
Sulphate of ammonia	180 "			

TABLE F.

	Yield with no Manure.	Yield with Muriate of Potash 100 lbs., and Sulphate of Ammonia 200 lbs. per acre, in 1886, 1887, and 1889.	Yield with Dissolved Bone-black 400 lbs. per acre, in 1886, 1887, and 1889.	Yield with Dissolved Bone-black 400 lbs., and Muriate of Potash 100 lbs. per acre, in 1886, 1887, and 1889.	Yield with Dissolved Bone-black 400 lbs., Muriate of Potash 100 lbs., and Sulphate of Ammonium 200 lbs. per acre, in 1886, 1887, and 1889.	Yield with Dissolved Bone-black 400 lbs., Muriate of Potash 150 lbs., and Sulphate of Ammonium 180 lbs. per acre, in 1886, 1887, and 1889.
Oats, 1886	54.1 bush. of 30 lbs.	64.5 bush. of 30 lbs.	55.2 bush. of 30 lbs.	54.3 bush. of 30 lbs.	82.9 bush. of 30 lbs.	68.0 bush. of 30 lbs.
Oats, 1887	27.4 " "	35.1 " "	28.1 " "	24.4 " "	38.7 " "	40.5 " "
Hay, 1888	2100 lbs.	2334 lbs.	2166 lbs.	2066 lbs.	2434 lbs.	2374 lbs.
Fallow, 1889	....	....	....	....	....	....
Peas, 1890	12.5 bush. of 60 lbs.	12.7 bush. of 60 lbs.	14.2 bush. of 60 lbs.	15.0 bush. of 60 lbs.	15.1 bush. of 60 lbs.	15.9 bush. of 60 lbs.
Oats, 1891	38.0 " 30 lbs.	41.0 " 30 lbs.	41.2 " 30 lbs.	42.1 " 30 lbs.	44.9 " 30 lbs.	42.6 " 30 lbs.
Total crop in 6 yrs.						
Oats	119.5 bushels.	140.6 bushels.	124.5 bushels.	120.8 bushels.	166.5 bushels.	151.0 bushels.
Hay	2100 lbs.	2336 lbs.	2166 lbs.	2066 lbs.	2434 lbs.	2374 lbs.
Peas	12.5 bushels.	12.7 bushels.	14.2 bushels.	16.0 bushels.	15.1 bushels.	15.9 bushels.

Tables D and E show that all of the fertilizers have had an effect on the oat crop of the present year, and that the complete fertilizers have produced the largest yields.

An examination of the total crops of the entire period, as shown in Table F, reveals the fact that what has been found true of this year's oat crop is also true of the combined oat crop and hay crop, i. e. that the largest yields have been produced by complete fertilizers.

Examining the results furnished by the crop of peas, we find that muriate of potash and sulphate of ammonia produced practically no effect; that dissolved bone black alone caused an increase of nearly 13 per cent; and that dissolved bone black and muriate of potash caused an increase of 28 per cent. in the crop, which was not added to by the complete fertilizers. The results obtained from these experiments add weight to the prevailing idea that on an ordinary soil peas do not require nitrogenous manures.

SUMMARY.

The experiment brings out strongly the facts:

(1.) That for the soil on which it was conducted, phosphoric acid and nitrogen are of value as manures.

(2) That phosphoric acid and potash are the most important fertilizing elements for peas.

THE COMPARATIVE EFFECT OF DIFFERENT AMOUNTS OF FERTILIZERS.

The object of this experiment is to study the limitations of the profitable use of commercial fertilizers. It must be remembered, however, that the work carried out on the college farm does not necessarily have a general application. But in view of the fact of the increasing use of commercial fertilizers, not only in this State but throughout the whole country, it is desirable to point out the existence of limitations, if there are any, that farmers may, in making their plans for carrying on their business, take them into consideration.

Tables G and H give the results of this year's cropping of the plots devoted to this purpose. Table I gives the results for the entire period together with the total value of crop, oats reckoned at 45 cents per bushel, hay at $10.00 per ton and peas at $1.25 per bushel. These values for the crop are liberal. The fertilizers have been reckoned at wholesale prices, dissolved bone black at $24.00 per ton, muriate of potash at 2 cents per pound, and sulphate of ammonia at 3 cents per pound, which is lower than farmers usually pay for these material.

TABLE G.

	No Manure.		Dissolved Bone-black 200 lbs., Muriate of Potash 50 lbs., and Sulphate of Ammonia 60 lbs. per acre.		Dissolved Bone-black 300 lbs., Muriate of Potash 100 lbs., and Sulphate of Ammonia 120 lbs. per acre.		Dissolved Bone-black 400 lbs., Muriate of Potash 150 lbs., and Sulphate of Ammonia 180 lbs. per acre.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Plot 1....	75.5	59.5						
" 7....	50.0	25.5						
" 13....	50.0	25.5						
" 19....	59.0	61.0						
" 25....	55.0	50.0						
" 31....	54.8	20.3						
" 22....			48.5	51.5				
" 28....			62.0	73.0				
" 34....			70.5	69.5				
" 23....					50.0	70.0		
" 29....					63.5	71.5		
" 35....					78.3	71.7		
" 24....							60.0	70.0
" 30....							63.0	67.0
" 36....							68.8	71.2
Average ..	57.0	40.1	60.1	64.7	63.9	71.1	63.9	69.4

TABLE H.

	Fertilizers per acre, in 1886, 1887, and 1889.	Yield of Oats per acre, in bushels.	Yield of Straw per acre, in pounds.	Increase of grain per acre, of manured plots over unmanured plots, in bu.
No manure..........................		38.0	802	
Dissolved bone-black...............	200 lbs.			
Muriate of potash..................	50 "	40.1	1294	2.1
Sulphate of ammonia...............	60 "			
Dissolved bone-black...............	300 "			
Muriate of potash..................	100 "	42.6	1422	4.6
Sulphate of ammonia...............	120 "			
Dissolved bone-black...............	400 "			
Muriate of potash..................	150 "	42.6	1388	4.6
Sulphate of ammonia...............	180 "			

TABLE I.

Crop.	Yield without Manure.	Yield with Dissolved Bone-black 200 lbs., Muriate of Potash 50 lbs., and Sulphate of Ammonia 60 lbs. per acre, in 1886, 1887, and 1889.	Yield with Dissolved Bone-black 300 lbs., Muriate of Potash 100 lbs., and Sulphate of Ammonia 120 lbs. per acre, in 1886, 1887, and 1889.	Yield with Dissolved Bone-black 400 lbs., Muriate of Potash 150 lbs., and Sulphate of Ammonia 180 lbs. per acre, in 1886, 1887, and 1889.
Oats, 1886	54.1 bushels.	57.5 bushels.	69.0 bushels.	68.0 bushels.
Oats, 1887	27.4 "	30.0 "	28.6 "	40.5 "
Hay, 1888	2100 lbs.	2166 lbs.	1767 lbs.	2374 lbs.
Fallow, 1889	....	....	....	....
Peas, 1890	12.7 bushels.	14.9 bushels.	13.7 bushels.	15.9 bushels.
Oats, 1891	38.0 "	40.1 "	42.6 "	42.6 "
Total value of crop	$80.14	$93.25	$89 04	$99.27
Value of crop on manured plots in excess of unmanured plots		$13.11	$8.90	$19.13
Value of fertilizers applied		$15 60	$27 60	$39.60

Table I furnishes the most important data. We find that the excess of the value of the crops on the manured plots over the unmanured plots is not sufficient to pay for the fertilizers in any case. We also find that the smallest amounts come nearer paying for themselves in the increase of the crop. It is probable, however, that the manured plots will continue to give larger yields on account of the applied fertilizers for some years to come. If the season of 1887 had been a favorable one for oats and an average crop produced, it is probable that those plots to which the least amount of fertilizer has been applied would have paid for the fertilizer in the increase of the crop. But it is not probable that either of the other sets of plots would have accomplished this result.

Conclusion.

From the investigation this conclusion can be safely drawn. Commercial fertilizers applied at the rate of 300 lbs. to 500 lbs. per acre are more likely to pay for themselves in increased crop produced than larger quantities.

SYSTEMS OF MANURING.

The object of this experiment is, as was stated in last year's report, to compare a system of manuring with stable manure with systems of manuring with commercial fertilizers and with cropping without manure.

A ten acre field was selected and divided into plots of two and one-half acres each, as shown in accompanying diagram.

These plots were cropped two years with hay previous to the application of any manure in order to gain an idea of the relative fertility of the different plots at the beginning of the experiment. The average annual yield of hay was found to be as follows:

	Per Plot.	Per Acre.
Plot 1	6,355 lbs.	2,542 lbs.
" 2	6,040 "	2,416 "
" 3	5,207 "	2,082 "
" 4	6,265 "	2,510 "

Plot 4, which is under cultivation without manure, is taken as a standard from which to reckon the productiveness of the other plots had they been cultivated without fertilization.

The yield of this plot is taken as 100 per cent. The average annual yields of the other plots for the two years they were in hay as compared with this plot are

Plot 1	101 per cent.
" 2	96 "
" 3	80 "
" 4	100 "

In calculating what the probable yield of plots 1, 2 and 3 would be for any year, had no fertilizer been applied, the crop of plot 4 is taken for that year and multiplied by the per cent. of plot 4 which those plots produced while in hay before manuring.

Below is given a diagram of the field with amounts of fertilizers applied in 1890.

EXPERIMENTAL FIELD NO. 2.

North.

No. 1. 20 loads (6⅝ cords) Stable Manure per acre.	2½ Acres.
No. 2. 1000 lbs. South Carolina Rock, 66 lbs. nitrate of soda, 16 lbs. sulphate of ammonia, 100 lbs. muriate of potash per acre.	2½ Acres.
No. 3. 500 lbs. Acid South Carolina rock, 66 lbs. nitrate of soda, 16 lbs. sulphate of ammonia, 100 lbs. muriate of potash per acre.	2½ Acres.
No. 4. No Manure.	2½ Acres.

South.

Last year the north half of each plot was in peas and the south half in barley.

Table J shows the yields per one-half plot and per acre of the two crops which have been discussed in detail in the Station Report of 1890.

TABLE J.

Number of plot.	Yield of grain per ½ plot in 1890.	Yield of straw per ½ plot in 1890.	Yield of grain per acre in 1890.	Yield of straw per acre in 1890.
No. 1, N. half.	604 lbs. peas.	1406 lbs. pea straw.	483 lbs. peas.	1205 lbs. pea straw.
S. half.	552 lbs. barley.	2958 lbs. barley "	441 lbs. barley.	2366 lbs. barley "
No. 2, N. half.	453 lbs. peas.	758 lbs. pea straw.	362 lbs. peas.	607 lbs. pea straw.
S. half.	553 lbs. barley.	2527 lbs. barley "	404 lbs. barley.	2022 lbs. barley "
No. 3, N. half.	373 lbs. peas.	843 lbs. pea straw.	300 lbs. peas.	678 lbs. pea straw.
S. half.	542 lbs. barley.	1799 lbs. barley "	434 lbs. barley.	1439 lbs. barley "
No. 4, N. half.	417 lbs. peas.	848 lbs. pea straw.	334 lbs. peas.	678 lbs. pea straw.
S. half.	220 lbs. barley.	1310 lbs. barley "	156 lbs. barley.	1048 lbs. barley "

In the spring of the present year this field was seeded to oats and clover, with the object of getting a clover sod to determine its effect on the insoluble phosphoric acid of the South Carolina rock. A good catch of clover was obtained over the entire field. The result of the oat crop is shown in table K.

TABLE K.

	Amount of fertilizers applied per acre in 1890.	Yield of oats per acre in 1891.		Calculated yield per acre without fertilizers.		Calculated gain per acre.	
		Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
Plot 1..	20 loads stable manure	1536 lbs	2282 lbs	1317 lbs	1187 lbs	219 lbs	1095 lbs
Plot 2..	1000 lbs. S. C. rock .... 66 lbs. nitrate of soda......... 16 lbs. sulphate of ammonia.. 100 lbs. muriate of potash	1447 lbs	1534 lbs	1252 lbs	1129 lbs	195 lbs	405 lbs
Plot 3..	500 lbs. acid S. C. rock........ 66 lbs. nitrate of soda......... 16 lbs. sulphate of ammonia.. 100 lbs. muriate of potash	1523 lbs	1449 lbs	1043 lbs	940 lbs	480 lbs	103 lbs
Plot 4..	No manure............	1304 lbs	1176 lbs				

Last year's report of this work with a barley crop shows that the acid South Carolina rock produced the largest increase in the yield of grain, that stable manure produced the next largest increase and the crude South Carolina rock the least. The result of this year's work shows that the same order is maintained with the oat crop.

Reference to the report of last year shows that peas gave a larger increase with crude South Carolina rock than with acid rock. Too little data has been obtained from which to form sweeping generalizations as to relative ability of different classes of plants to gather their phosphoric acid from crude phosphates. But the writer is inclined to the belief, from the results obtained on this field and on Experimental Field No. 1, together with those obtained in the Leland experiment, a report of which follows, that leguminous plants are better adapted to this purpose than the cereals.

On Peas as a Crop to Precede Grain.

Leguminous plants have been designated as collectors of nitrogen and the cereals as dissipators of nitrogen. Many practical men have generalized from this that all leguminous crops are especially fitted to precede the cereals as collectors of nitrogen for the latter crop. This view of the case is probably correct, when a considerable portion of the leguminous plant is left upon the ground, as with clover. The theory may well be questioned, however, so far as such crops as peas and beans are concerned, they having no large roots to leave in the soil, and with which the entire ærial portion of the plant is removed.

In connection with the experimental work described above a little data bearing on this point has incidentally been obtained.

It has already been noted that the north half of each of the plots on Experimental Field No. 2 was last year cropped with peas and the south half with barley, and that the entire field was cropped with oats this year.

Table L shows the yield of oats and straw per plot and per acre as divided between the north and south half of each plot.

TABLE L.

Number of plot.	Yield of grain per plot in 1891.	Yield of straw per plot in 1891.	Yield of grain per acre in 1891.	Yield of straw per acre in 1891.
No. 1, N. half....	1952 lbs. oats.	3148 lbs. oat straw.	1562 lbs. oats.	2518 lbs. oat straw.
S. half....	1888 lbs. oats.	2557 lbs. oat straw.	1510 lbs. oats.	2046 lbs. oat straw.
No. 2, N. half....	1590 lbs. oats.	2150 lbs. oat straw.	1272 lbs. oats.	1720 lbs. oat straw.
S. half....	2029 lbs. oats.	1686 lbs. oat straw.	1623 lbs. oats.	1349 lbs. oat straw.
No. 3, N. half....	1889 lbs. oats.	1921 lbs. oat straw.	1513 lbs. oats.	1537 lbs. oat straw.
S. half....	1918 lbs. oats.	1702 lbs. oat straw.	1534 lbs. oats.	1362 lbs. oat straw.
No. 4, N. half....	1594 lbs. oats.	1456 lbs. oat straw.	1275 lbs. oats.	1165 lbs. oat straw.
S. half....	1667 lbs. oats.	1484 lbs. oat straw.	1334 lbs. oats.	1187 lbs. oat straw.

An examination of this table shows that, with the exception of plot No. 1, to which stable manure was applied, that portion devoted to peas last year gave a smaller yield of oats this year than the portion on which barley was produced last year.

The large difference in the yield between the north and south halves of plot No. 2 can, in part, be explained by the fact that witch grass gained a footing on the north half while the south half was free from it. The yield on the north half was doubtless depressed somewhat on that account. But plots 3 and 4 contained no witch grass and the results obtained from them show nothing favorable to the theory that peas are a better crop to precede a cereal than a cereal.

An Experiment to Test the Relative Ability of Different Crops to Obtain Phosphoric Acid From Crude Phosphates.

This experiment was conducted for the Station by H. L. Leland, of East Sangerville, on a slaty gravel soil. Great credit is due him for the care with which the details of the work were carried out.

A field of three acres, whose dimensions were 20 rods by 24 rods, was divided into three parts, each containing just an acre, with dimensions 8 rods by 20 rods. To the first acre there were applied 500 lbs. of dissolved bone black and 100 lbs. of nitrate of soda; to the second acre there were applied 1000 lbs. of raw South Carolina rock and 100 lbs. of nitrate of soda; to the third acre, 500 lbs. of a Caribbean Sea guano and 100 lbs. of nitrate of soda were applied.

Each acre was then divided into twenty plots one rod wide and eight rods long, containing one-twentieth of an acre, and seeded as shown in the opposite diagram:

	FIRST ACRE.	SECOND ACRE.	THIRD ACRE.
Plot.	500 lbs. dissolved bone-black and 100 lbs. nitrate of soda per acre.	1000 lbs. South Carolina rock, and 100 lbs. nitrate of soda per acre.	500 lbs. Caribbean Sea guano and 100 lbs. nitrate of soda per acre.
1	Clov	Clover.	Clover.
2	Oats.	Oats.	Oats.
3	Peas.	Peas.	Peas.
4	Turnips.	Turnips.	Turnips.
5	Wheat.	Wheat.	Wheat.
6	Beans.	Beans.	Beans.
7	Potatoes.	Potatoes.	Potatoes.
8	....	....	....
9	Corn.	Corn.	Corn.
10	Barley.	Barley.	Barley.
1*d*	Clover.	Clover.	Clover.
2*d*	Oats.	Oats.	Oats.
3*d*	Peas.	Peas.	Peas.
4*d*	Turnips.	Turnips.	Turnips.
5*d*	Wheat.	Wheat.	Wheat.
6*d*	Beans.	Beans.	Beans.
7*d*	Potatoes.	Potatoes.	Potatoes.
8*d*	....	....	....
9*d*	Corn.	Corn.	Corn.
10*d*	Barley.	Barley.	Barley.

20 Rods.

24 Rods.

Mr. Leland writes that the drought from the middle of May to the last of June seriously affected the crop. A neighboring farmer on land adjoining obtained only ten bushels of oats per acre.

The crops of oats, barley, wheat, peas and beans were so small that they were weighed without threshing. The corn was destroyed by grubs and was counted an entire failure.

The following table shows the yields of the various plots and the amounts and kinds of fertilizers used:

	Crop.	500 lbs. dissolved bone-black and 100 lbs. nitrate of soda per acre.	1,000 lbs. South Carolina rock and 100 lbs. nitrate of soda per acre.	500 lbs. Caribbean Sea guano and 100 lbs. nitrate of soda per acre.
Plot 1..	Clover . .	Fair.	Best at close of season.	Very poor.
" 2..	Oats . . .	Total crop 115 lbs.	Total crop 80 lbs.	Total crop 75 lbs.
" 3..	Peas . . .	" " 105 "	" " 110 "	" " 51 "
" 4..	Turnips .	351 "	369 "	Failure.
" 5..	Wheat . .	Total crop 120 lbs.	Total crop 105 "	Total crop 65 lbs.
" 6..	Beans . .	" " 63 "	" " 62 "	" " 54 "
" 7..	Potatoes .	228 "	210 "	153 "
" 8..	. . .	. . . .	. . . .	. . . .
" 9..	Corn . . .	Failure.	Failure.	Failure.
" 10..	Barley . .	Total crop 80 lbs.	Total crop 75 lbs.	Total crop 64 lbs.
" 1*d*.	Clover . .	Fair.	Best at close of season.	Very poor.
" 2*d*.	Oats	Total crop 111 lbs.	Total crop 83 lbs.	Total crop 79 lbs.
" 3*d*.	Peas . . .	" " 97 "	" " 103 "	" " 52 "
" 4*d*	Turnips .	340 "	361 "	Failure.
" 5*d*.	Wheat . .	Total crop 119 "	Total crop 102 "	Total crop 61 "
" 6*d*.	Beans . .	" " 66 "	" " 72 "	" " 43 "
" 7*d*.	Potatoes .	223 "	211 "	146 "
" 8*d*.	. . .	. . . .	. . . .	. . . .
" 9*d*.	Corn . . .	Failure.	Failure.	Failure.
" 10*d*.	Barley . .	Total crop 77 lbs.	Total crop 78 lbs.	Total crop 62 lbs.

An examination of the yields of the different crops shows that the dissolved bone black has given with the majority of them the largest return and the Caribbean Sea guano the least.

With peas and turnips South Carolina rock seems to have been more effective than dissolved bone black. This point is brought out quite sharply. The fact that turnips respond to manuring with some crude phosphates has been noted by other experimenters.

The results obtained in this experiment with South Carolina rock on peas agree very closely with the results obtained from all other experiments made by the Station covering this point.

Growing Mixed Grains Compared with Growing Grains Separately.

In accordance with the recommendation of the Station Council, trials have been made to test the advantages of growing wheat and oats mixed as compared with growing them separately. Six plots were measured off, 43.6 feet by 240 feet, on land that had been plowed the previous fall and manured at the rate of five cords of stable manure per acre. The seed was sown broadcast May 7th and crop harvested August 24th.

The following table shows the arrangement of the plots, the amount of seed applied and the yield per plot and per acre.

Number of plot.	Seed per plot.	Yield of grain per plot.	Yield of straw per plot.	Yield of grain per acre.	Yield of straw per acre.
1	12 lbs. oats..............	451.5 lbs.	563.5 lbs	2052 lbs.	2561 lbs.
2	8 lbs. oats, 8 lbs. wheat...	367.0 "	593.0 "	1667 "	2696 "
3	24 lbs. wheat............	314.5 "	515.5 "	1429 "	2343 "
4	12 lbs. oats..............	405.0 "	485.0 "	1841 "	2204 "
5	8 lbs. oats, 8 lbs. wheat...	343.5 "	546.5 "	1561 "	2484 "
6	24 lbs. wheat............	307.0 "	583.0 "	1391 "	2650 "

The trial is decidedly in favor of oats separately, as compared with oats and wheat mixed, and oats and wheat mixed, as compared with wheat alone.

These results are in opposition to the teachings of many of our best farmers. A few years ago similar trials were made on the college farm of mixtures of oats and peas which resulted in showing that a larger number of pounds of peas could be produced alone than of a mixture of oats and peas, and that more pounds of the mixture of oats and peas than of oats alone.

Conclusion.

The conclusion of the writer is that the crop that yields the largest number of pounds per acre when grown alone will not be benefited by mixing with a crop that produces a less number of pounds per acre.

TRIALS OF SPRING AND FALL MANURING.

On a section of a field, lying west of Experiment Field No. 2, two plots were laid off, one of which was manured in the fall at the rate of five cords of stable manure per acre, and the other manured at the same rate in the Spring. The plots, owing to the shape of the field, are of unequal size but quite uniform in character of soil. On account of the variation in size the yields per plot do not show the relative effect of the manure; but the yields per plot have been calculated per acre and are shown on the following table.

These plots were sown to oats May 2 and harvested August 24.

	Dimensions of plots.	Time of manuring.	Yield of grain per plot.	Yield of straw per plot.	Yield of grain per acre.	Yield of straw per acre.
Plot 1.	143 ft.x84 ft.....	Fall........	395.5 lbs.	654.5 lbs.	1327 lbs.	2190 lbs.
Plot 2.	161 ft.x74 ft.....	Spring.....	411.5 lbs.	593.5 lbs.	1507 lbs.	2175 lbs.

The Spring manuring has given the largest yield of grain, and the Fall manuring the largest yield of straw per acre. At some future time this work will be repeated.

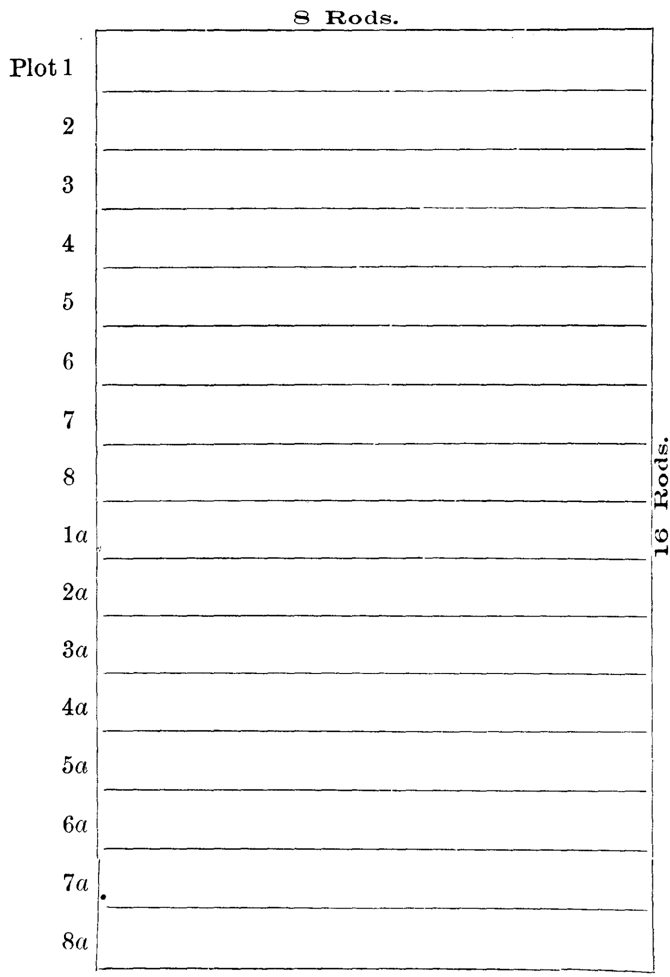
Farmers' Experiments.

It has been the policy of the Station to encourage farmers in studying the application of well known facts in connection with plant growth and soils to the business of producing crops. To this end experimental sets of fertilizers have been sent from time to time to farmers who desired to undertake work of this kind. Eight such sets were shipped to farmers last Spring. Reports have been received from five of them which are of local interest in the neighborhoods where the experiments were carried out.

These sets of fertilizers supplied phosphoric acid, potash and nitrogen, separately, and in various combinations, and were designed to test the ability of the soil to supply one or more of these substances to the crop in such quantities as to render their application superfluous or unprofitable.

Each experiment involved the cultivation of sixteen one-twentieth acre plots as shown in the diagram below.

The plots 1*a* to 8*a* are duplicates of plots 1 to 8. The kinds and quantities of fertilizers used on each plot are indicated in the report of each experiment. Dissolved bone black furnishes phosphoric acid, nitrate of soda, nitrogen, and muriate of potash, potash.



Experiment of H. C. Towsand, Fort Fairfield.

Crop, potatoes, planted May 23 in checks 32 inches each way, making 288 hills per plot. Whole seed was used, just below market size. Rust struck the tops August 12 which greatly reduced the yield. Potatoes dug and weighed Sept. 26-29. Below are given the results:

Fertilizers applied.	Amount of fertilizer per acre.	No. of plot.	Weight of crop in pounds.	No. of plot.	Weight of crop in pounds.	Average yield of combined plots per acre.
	lbs.					bush.
Dissolved bone-black .... Nitrate of soda .... Muriate of potash	500 150 100	1	578	1*a*	564	190.3
Dissolved bone-black .... Muriate of potash	500 100	2	511	2*a*	597	184.7
Dissolved bone-black .... Nitrate of soda	500 150	3	516	3*a*	559	179.3
Dissolved bone-black	500	4	455	4*a*	503	159.7
Muriate of potash .... Nitrate of soda	100 150	5	408	5*a*	440	141.3
Nitrate of soda	150	6	418	6*a*	415	138.8
Muriate of potash	100	7	370	7*a*	421	131 8
No manure	....	8	335	8*a*	374	118.2

The table below shows the increase of crop on manured plots over unmanured plots calculated per acre, and the cost of fertilizers used, on the basis of dissolved bone black at $24.00 per ton, muriate of potash at 2 cents per pound and nitrate of soda at 2 cents per pound, also cost of increase per bushel.

Plots.	Increase in crop per acre due to fertilizers.	Cost of fertilizer per acre.	Cost of increase per bushel.
1 and 1*a*.......	72.1 bushels.	$11.00	15.2 cents.
2 and 2*a*.......	66.5 "	$8.00	12.0 "
3 and 3*a*.......	61.3 "	$9.00	14.3 "
4 and 4*a*.......	41.5 "	$6.00	14.5 "
5 and 5*a*.......	23.1 "	$5.00	21.2 "
6 and 6*a*.......	20.6 "	$3.00	14.6 "
7 and 7*a*.......	13.6 "	$2.00	14.7 "
8 and 8*a*.......			

In this experiment all of the fertilizers caused an increase in the crop but the combination of dissolved bone black and muriate of potash produced the increase at the least cost per bushel.

Experiment of F. A. Herrick, Easton.

Crop, potatoes, planted June 1 by hand, 5 rows to a plot and 50 hills in a row. No misfortune happened to the crop except missing hills. As the missing hills varied with the different plots, in the table the yields are calculated for 250 hills per plot.

Fertilizers applied.	Amount of fertilizers per acre in lbs.	No. of plot.	Weight of crop per plot in lbs.	No. of plot.	Weight of crop per plot in lbs.	Average yield of combined plots per acre, bush.
Dissolved bone-black Nitrate of soda Muriate of potash	500 150 100	1	398	1*a*	413	135.3
Dissolved bone-black Muriate of potash	500 100	2	319	2*a*	413	122.0
Dissolved bone-black Nitrate of soda	500 150	3	363	3*a*	408	128.5
Dissolved bone-black	500	4	310	4*a*	339	106.7
Muriate of potash Nitrate of soda	100 150	5	161	5*a*	181	57.0
Nitrate of soda	150	6	126	6*a*	156	47.0
Muriate of potash	100	7	211	7*a*	151	60.3
No manure	....	8	215	8*a*	165	63.3

Table showing increase of crop on manured plots over unmanured plots and cost of increase per bushel at wholesale prices quoted above for fertilizers.

Plots.	Increase of plot per acre due to fertilizers.	Cost of fertilizers per acre.	Cost of increase per bushel.
1 and 1*a*	72.0 bushels.	$11.00	15.3 cents.
2 and 2*a*	58.7 "	$8.00	13.6 "
3 and 3*a*	65.2 "	$9.00	13.8 "
4 and 4*a*	43.4 "	$6.00	13.8 "
5 and 5*a*	—6.3 "	$5.00	
6 and 6*a*	—16.3 "	$3.00	
7 and 7*a*	—3.0 "	$2.00	
8 and 8*a*			

In this experiment nitrate of soda and muriate of potash mixed and separately seems to have worked absolute harm to the crop, though when combined with dissolved bone black they produced an increase in the crop. So far as cost of increase per bushel is concerned, the results are slightly in favor of dissolved bone black and muriate of potash.

Experiment of Geo. Ingraham, Houlton.

Crop, potatoes; on clay loam, hill land; in grass previous season; cut about one-half ton of hay per acre; plowed in Fall of 1890; ground well harrowed; furrowed with a horse hoe at time of planting; fertilizers drilled in the furrow and well mixed with the soil before dropping the seed; planted to Beauty of Hebrons, 10 bushels per acre. The rust struck the vines early in the season and at the time of digging about one-half of the crop proved rotten. The table below shows the yields of sound potatoes only.

Fertilizers applied.	Amount of fertilizers per acre in pounds.	No. of plot.	Weight of crop per plot in lbs.	No. of plot.	Weight of crop per plot in lbs.	Average yield of combined plots per acre, bush.
Dissolved bone-black .... Nitrate of soda................. Muriate of potash	500 150 100	1	457	1*a*	461	153.0
Dissolved bone-black................. Muriate of potash	500 100	2	473	2*a*	459	155.3
Dissolved bone-black .... Nitrate of soda.................	500 150	3	458	3*a*	470	154.7
Dissolved bone-black	500	4	488	4*a*	465	158.8
Muriate of potash .... Nitrate of soda	100 150	5	433	5*a*	427	143.2
Nitrate of soda.................	150	6	422	6*a*	430	142.0
Muriate of potash	100	7	428	7*a*	440	144.7
No manure.................	....	8	215	8*a*	261	78.0

Table showing increase of crop on manured plots over unmanured plots and cost of increase per bushel at wholesale prices quoted above for fertilizers.

Plots.	Increase of crop per acre due to fertilizers.	Cost of fertilizers per acre.	Cost of increase per bushel.
1 and 1*a*.......	75.0 bushels.	$11.00	14.6 cents.
2 and 2*a*.......	77.3 "	$8.00	10.3 "
3 and 3*a*.......	76.7 "	$9.00	11.7 "
4 and 4*a*.......	80.8 "	$6.00	7.4 "
5 and 5*a*.......	65.2 "	$5.00	7.6 "
6 and 6*a*.......	64.0 "	$3.00	4.7 "
7 and 7*a*.......	66.7 "	$2.00	3.0 "
8 and 8*a*.......			

In this experiment Mr. Ingraham judged that one-half of the potatoes were rotten and reported the weight of the sound ones only, so that no accurate estimate can be made of the effect of the fertilizers. All of the fertilizers increased the crop largely, however. The cost of the increase is least with muriate of potash, while the largest crop was produced with dissolved bone black.

Experiment of Charles S. Pope, Manchester.

The crop grown was barley. The combined weights of the crops on the duplicate plots are given so that the weights represent the grain produced on one-tenth of an acre instead of a twentieth.

Fertilizers applied.	Amount of fertilizers per acre in lbs.	No. of plot.	Weight of grain in lbs.	Weight of straw in lbs.	Yield of barley per acre, bush.
Dissolved bone-black Nitrate of soda Muriate of potash	500 150 100	1 and 1*a*	159	260	33.1
Dissolved bone-black Muriate of potash	500 100	2 and 2*a*	145	215	30.2
Dissolved bone-black Nitrate of soda	500 150	3 and 3*a*	138	216	26.7
Dissolved bone-black	500	4 and 4*a*	109	176	22.7
Muriate of potash Nitrate of soda	100 150	5 and 5*a*	91	172	19.0
Nitrate of soda	150	6 and 6*a*	73	165	15.2
Muriate of potash	100	7 and 7*a*	71	168	14.8
No manure	....	8 and 8*a*	61	147	12.7

Table showing increase in barley crop on manured plots over unmanured plots and cost of increase per bushel at wholesale prices quoted above.

Plots.	Increase of crop per acre due to fertilizers.	Cost of fertilizer per acre.	Cost of increase per bushel.
1 and 1*a*	20.4 bushels.	$11.00	55 cents.
2 and 2*a*	17.5 "	$8.00	46 "
3 and 3*a*	14.0 "	$9.00	64 "
4 and 4*a*	10.0 "	$6.00	60 "
5 and 5*a*	6.3 "	$5.00	79 "
6 and 6*a*	2.5 "	$3.00	120 "
7 and 7*a*	2.1 "	$2.00	95 "
8 and 8*a*			

In this experiment dissolved bone black and muriate of potash produced the increase in crop at the least cost per bushel, while dissolved bone black, muriate of potash and nitrate of soda caused the largest gain in crop.

EXPERIMENT OF I. O. WINSLOW, ST. ALBANS.

Crop, corn; soil, gravelly loam; plots, one-thirtieth of an acre instead of one-twentieth; crop weighed in the ear with the husks on.

Fertilizers applied.	Amount of fertilizers per acre in lbs.	No. of plot.	Weight of corn per plot in ears.	No. of plot.	Weight of corn per plot in ears.	Average weight of corn per plot in ears.
			lbs.		lbs.	lbs.
Dissolved bone-black	750	1	180	1*a*	240	210
Muriate of potash	150					
Nitrate of soda	225					
Dissolved bone-black	750	2	175	2*a*	245	210
Muriate of potash	150					
Dissolved bone-black	750	3	93	3*a*	156	130
Nitrate of soda	225					
Dissolved bone-black	750	4	71	4*a*	135	103
Muriate of potash	150	5	202	5*a*	221	212
Nitrate of soda	225					
Nitrate of soda	225	6	121	6*a*	69	95
Muriate of potash	150	7	194	7*a*	92	143
No manure		8	77	8*a*	68	73

Table showing the yield of corn on the ear, in the husk, on manured plots over unmanured plots, together with the cost of fertilizers at wholesale prices quoted above.

Plots.	Increase of crop per acre due to fertilizers.	Cost of fertilizers per acre.
1 and 1*a*	2055 lbs.	$16.50
2 and 2*a*	2055 "	12.00
3 and 3*a*	855 "	13.50
4 and 4*a*	450 "	9.00
5 and 5*a*	2085 "	7.50
6 and 6*a*	229 "	4.50
7 and 7*a*	850 "	3.00
8 and 8*a*		

In this experiment nitrate of soda and muriate of potash gave not only the largest yield but produced the increase in crop at the least expense for fertilizers. Muriate of potash and dissolved bone black gave the same yield as muriate of potash, nitrate of soda and dissolved bone black.

These experiments demonstrate that commercial fertilizers may be used to great advantage by all of the experimenters. They also show that in order to obtain the greatest profit they must be used with a knowledge of what the soil can furnish as well as the requirements of the crop.

In view of the fact, that in four out of five of these experiments the increase in the crop was produced at least expense with either potash, or phosphoric acid, or a combination of the two, it would be well for the experimenters to continue their studies of the effect of application of those materials in a rotation of crops in which the clover has a place, relying on the clover to keep up the nitrogen supply. In the fifth experiment, in which not only the largest crop, but the crop in which the increase was produced at least expense, came from a manuring with muriate of potash and nitrate of soda, it would be advisable to try an experiment to see if the clover in rotation could not be made to take the place of the nitrate of soda.

REPORT OF METEOROLOGIST.

President Fernald, Meteorologist to the Station.

MAINE EXPERIMENT STATION.

Lat, 44°, 54', 2", N. Long, 68°, 40', 11", W.

In the meteorological work undertaken by the Experiment Station, the object sought is not so much the observing and reporting of general atmospheric phenomena as the careful study of the special meteorological conditions which are more or less intimately connected with practical agriculture.

A reliable determination of these conditions from which safe deductions can be made, necessarily involves observations continued through a series of years.

Accordingly in commencing the work of observation, a plan was formed which has been strictly adhered to during the past three years.

This report contains a summary of results afforded by about thirty thousand independent observations. Under each division of the subject here considered, the observations of the past year are continuous to those of the two preceding years.

Since the instruments have remained unchanged in position during the three years under notice, I draw freely from my former reports, in presenting the arrangement of instruments and the other needful descriptive or explanatory data.

The most of the instruments employed were manufactured by H. J. Green of Brooklyn, N. Y. Mr. Robert H. Fernald of Orono, has been observer during the three years that this work has been carried on. In this report the results of observations made during the years 1889, 1890, and 1891, are combined.

The several problems considered appear in definite order, in the following pages. The first to which attention has been given, is a determination of the percentage of moisture in forest as compared with that in open field.

The arrangement of instruments for this investigation is herewith submitted.

Hygrometer No. 1 is placed in a wooden stand constructed for thermometrical instruments and located in the open field remote from buildings. Hygrometer No. 2 also is enclosed in a wooden box, perforated to allow a free circulation of air, and located also in the open field. Hygrometer No. 3 is also enclosed in a perforated box attached to a tree in a moderately dense forest. Hygrometer No. 4 is placed in a similar box attached to a tree in a portion of the forest a little more open than that in which No. 3 is located, but near which is a running brook except during the driest part of the summer.

Each hygrometer is about four feet above the surface of the ground. Readings are taken three times daily, at 7 A. M., at 1 P. M., and at 7 P. M., local time.

Observations were commenced April 5, 1889 and they have been continued through the growing seasons of 1889, 1890, and 1891.

The monthly averages are given in the following tables on the scale of 100.

Percentages of Moisture.

HYGROMETER NO. 1.—IN OPEN FIELD.

	1889.			1890.			1891.			
	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	Mean
April,	81	53	66	74	50	58	85	61	67	66
May,	84	60	71	81	62	74	82	57	67	71
June,	88	67	81	83	72	75	83	62	71	76
July,	85	65	75	85	74	79	87	61	72	76
August,	95	70	80	90	63	77	89	67	83	79
September,	93	68	83	93	76	85	92	67	84	82
October,	94	66	79	90	62	79	90	63	80	78
Mean results,	89	64	76	85	66	75	87	63	75	76

HYGROMETER NO. 2.—IN OPEN FIELD.

	1889.			1890.			1891.			
	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	Mean
April,	78	52	65	70	46	56	84	62	70	65
May,	80	53	68	78	61	74	80	55	68	68
June,	84	66	74	78	68	75	82	62	73	73
July,	79	60	69	80	63	71	86	62	75	72
August,	87	67	75	88	62	73	87	65	80	76
September,	91	60	81	91	67	83	91	67	85	80
October,	93	66	81	91	62	79	91	65	82	79
Mean results,	85	61	72	82	61	73	86	63	76	72

HYGROMETER NO. 3.—IN FOREST.

	1889.			1890.			1891.			
	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	Mean
April,	81	62	69	78	61	69	90	73	77	76
May,	83	63	73	87	74	81	86	68	75	77
June,	89	80	84	87	77	82	88	81	84	84
July,	94	86	91	93	85	83	92	80	85	90
August,	91	89	93	94	80	84	95	81	88	88
September,	96	88	92	96	87	92	95	81	92	91
October,	96	90	90	96	86	90	92	77	86	89
Mean results,	90	80	85	90	79	83	91	77	84	85

HYGROMETER NO. 4.—IN FOREST.

	1889.			1890.			1891.			
	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	Mean
April,	83	65	77	79	60	71	91	74	82	76
May,	89	66	80	88	73	84	87	69	78	79
June,	92	81	86	89	77	84	90	74	82	84
July,	93	79	87	91	79	85	93	79	86	86
August,	95	86	91	91	78	85	96	78	90	88
September,	96	83	90	97	86	92	96	79	92	90
October,	96	80	90	94	80	89	92	76	87	87
Mean results,	92	77	86	90	76	84	92	75	85	84

Percentages of Moisture.

RESULTS FOR 1889, 1890, AND 1891, COMBINED.

	7 A. M.	1 P. M.	7 P. M.	Mean
Hygrometer No. 1, in open field,	87	64	75	75
" " 2, " " "	84	62	74	73
" " 3, in forest,	90	79	84	84
" " 4, " "	91	76	85	84

Regarding the mean results from hygrometers Nos. 1 and 2 as indicating percentages for the open field, we have the following summary of results:

	7 A. M.	1 P. M.	7 P. M.	Mean
Percentages of moisture, open field,	85	63	74	74

Regarding the mean results from hygrometers No. 3 and 4 as indicating percentages for forests only moderately dense, we have the following summary results:

	7 A. M.	1 P. M.	7 P. M.	Mean
Percentages of moisture, forest,	90	78	84	84

Comparing results, open field and forest, we have excess of moisture in forest above that in open field expressed in percentages.

7 A. M.	1 P. M.	7 P. M.	Mean
5	15	10	10

It thus appears from observations covering the period of growth of three years, that the excess of moisture in forest above that of open field in the morning, amounts to but 5 per cent., while in the middle of the day it rises to 15 per cent., and at night-fall drops down to 10 per cent., and that the mean excess for the day is 10 per cent. In a very dense forest the percentage of excess would undoubtedly rise much higher. The presence of patches of forest in any region exerts a marked influence on the hygroscopic conditions of the atmosphere, and this condition, in turn, is an important factor in the growth of vegetation.

Soil Temperatures.

In this investigation a knowledge of the temperature of the soil at different depths, during the growing season, is sought, and ultimately the law which represents the rate of change of temperature at different depths.

The periods covered by the experiment are from May 1 to Nov. 1, 1889, from April 1 to Nov. 1, 1890, and from April 1 to Nov. 1, 1891, with thermometers placed in the soil to the depths of 1, 3, 6, 9, 12, 24 and 36 inches.

The thermometers have been allowed to remain in place during the winters intervening between the periods of observation.

Their location is in the open field, near hygrometer No 2, in the tract of land assigned to the Station for experimental purposes and devoted to farm experiments. The character of the soil is regarded, therefore, as representative of that on which the field experiments by the Station are carried on.

A summary of results for the three seasons by monthly averages is given in the annexed tables.

SOIL THERMOMETERS—1889.

	1 inch.			3 inches.			6 inches.			9 inches.			12 inches.			24 inches.			36 inches.		
	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
May..................	51.77	62.92	59.20	51.50	60.33	59.70	52.92	55.21	57.04	53.49	53.31	55.44	52.46	52.15	53.21	48.84	49.06	49.01	46.28	46.42	46.48
June..................	61.94	71.54	67.56	61.38	69.62	67.76	61.85	68.43	65.35	62.07	62.27	63.51	61.26	61 10	61.79	57.23	57.43	57.41	54.36	54.54	54.52
July..................	63.41	72.10	68.89	63.10	70.86	69.54	64.25	66.51	67.48	64.93	65.15	66.27	64.30	64.02	64.29	60.99	61.14	61.03	58.50	58.62	58.57
August..................	61.18	69.59	66.90	61.75	68.91	68.01	62.90	64.83	66.01	59.82	63.88	65.01	63.31	63.10	63.31	60.96	61.10	60.97	59.16	59.31	59.23
September............	57.11	61.56	61.45	57.74	63.01	62.89	59.47	60.25	61.29	60.29	60.20	60.93	60.30	60.21	60.04	59.42	59.51	59.36	58.40	58.51	58.37
October..............	42.80	43.59	45.50	43.80	47.31	46.72	46.06	46.48	47.12	47.21	46.97	47.32	48.17	47.83	47.85	50.63	50.65	50.54	51.66	51.66	51.61
Mean............	56.37	63.55	61.58	56.54	63.34	62.44	57.91	60.28	60.71	57.97	58.63	59.75	58.30	58.06	58.41	56.34	56.48	56.39	54.84	54.73	54.79
Mean temperature for six months		° 60.50			° 60.77			° 59.63			° 58.78			° 58.26			° 56.40			° 54.79	

SOIL THERMOMETERS—1890.

	1 inch.			[3 inches.			6 inches.			9 inches.			12 inches.			24 inches.			36 inches.		
	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.
	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
April	33.74	40.35	36.89	36.53	38.12	37.11	34.32	34.55	35.13	33.56	34.09	34.29	34.57	34.55	34.75	34.81	34.83	34.95	35.31	35.39	35.37
May	50.38	54.80	51.53	47.63	54.67	53.40	49.40	50.26	51.49	49.29	49.27	49.72	48.80	48 68	48.82	45.72	45.55	45.84	43.27	43.72	43.77
June..	56.06	60.05	59.68	55.91	60.44	60.07	56.11	56.78	57.55	55.85	55.95	56.32	55.99	55.95	55.82	53.52	53.18	53.27	50.85	50.94	50.96
July	62.82	64.69	64.03	62.66	66.93	66.81	65.91	64.11	64.87	62.85	62.95	63.88	62.70	62.60	62 78	58.77	58.84	58.77	56.25	56.28	56.34
August...........	61.80	68.20	67.28	62.15	67.60	67.41	63.69	65.08	66.26	63.91	64.16	64.83	63.87	63.84	63.91	61.72	62.09	61.34	59.43	59.40	59.39
September	56.51	59.83	59.43	57.44	58.93	59.62	58.21	58.56	59.34	58.36	58.30	58.59	58.73	58.58	58.56	58.15	58.43	58.37	57.73	58.05	57.65
October	45.37	47.17	46.67	45 77	47.16	46.76	47.09	47.10	47.23	47.40	47.32	47.66	48.81	48.72	48.59	51.08	50.97	50.86	52.07	52.04	52.00
Mean.............	52.38	56.44	55.07	52.58	56.29	55.88	53.54	53.78	54.55	53.03	53.15	53.61	53.35	53.27	53.32	51 97	51.99	51.[illegible]	50.70	50.83	50.78
Mean temperature for seven months,		o 54.63			o 54.92			o 53.96			o 53.26			o 53.31			o 51.96			o 50 77	

SOIL THERMOMETERS—1891.

	1 inch.			3 inches.			6 inches.			9 inches.			12 inches.			24 inches.			36 inches.		
	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
April.............	37.70	42.48	42.34	37.69	42.32	42.41	39.03	39.81	41 40	37.64	37.68	39.93	38.80	38.69	38.58	36.87	36.96	37.01	37.46	37.53	37.53
May..............	46.54	54.03	52.93	54 31	53.73	52.87	47.49	49.27	51.24	47.83	48.22	49.36	47.64	47.63	47.90	45.00	45.14	45.20	43.78	43.49	43.50
June.............	59.18	65.42	64.53	59.10	64 80	64.21	59.43	60.40	61.73	59.23	58.96	59.67	58.79	58.37	58.60	54.00	54.12	54.11	51.25	51.35	51.37
July.	62.70	68.59	67.44	62.78	67.56	67.10	63.08	64.23	65.18	63.17	63.18	62.85	62.39	62 14	62.44	58.16	58.25	58.26	55.75	55.82	55.82
August...........	62.45	69.07	67.46	62.59	68.03	67.45	63.98	64.97	66.62	63.93	63.99	64.99	63.80	63.59	63.91	60.72	60.83	60.76	58.66	58.75	58.37
September.......	58.82	62.88	62.41	59.00	62.85	62.55	60.43	60.99	62.00	60.57	60.48	61.21	60.77	60.60	60.73	59.67	59.70	59.65	58.53	58.61	58.36
October..........	46.03	48.78	47.94	46.20	48.86	48.22	48.20	48.54	48.81	48.78	48.57	49.17	50.02	49.86	49.77	52.74	52.67	52.53	53.61	53.58	53.50
Mean.............	53.35	58.75	57.86	54.52	58.31	57.83	54.52	55.46	56.71	54.45	54.44	55.34	54.60	54.41	54.56	52.45	52.52	52.50	51.29	51.30	51.49
Mean temperature for seven months,	° 56.65			° 56.89			° 55.56			° 54.74			° 54.52			° 52.49			° 51.36		

In order that comparisons may be made between soil temperatures at different depths and the air temperatures during the same months and in the same locality, the following tables are added:

THERMOMETER IN THE OPEN AIR.

(Locality the same as that of the soil thermometers.)

1889.

	7 A.M. °	1 P.M. °	7 P.M. °	Mean. °
May,	52.95	68.30	59.47	60.24
June,	63.36	74.27	68.07	68.57
July,	65.12	75.75	70.86	70.58
August,	59.97	74.20	66.81	66.99
September,	54.39	70.86	61.55	62.27
October,	37.41	52.80	44.05	44.75
Mean,	55.53	69.36	61.80	62.23

1890.

	7 A.M. °	1 P.M. °	7 P.M. °	Mean. °
April,	35.76	49.02	42.55	42.44
May,	49.16	60.60	53.58	54.45
June,	57.95	67.64	62.76	62.78
July,	67.10	76.19	71.85	71.71
August,	61.50	73.78	68.84	68.04
September,	52.04	66.16	58.52	58.91
October,	37.70	53.19	45.63	45.51
Mean,	51.60	63.80	57.68	57.69

1891.

	7 A.M. °	1 P.M. °	7 P.M. °	Mean. °
April,	36 33	48.26	43.64	42.74
May,	47.07	61.75	53.30	54.04
June,	58.28	72.42	65.38	65.36
July,	64.08	76.05	68.81	69.65
August,	62.07	74.94	67.47	68.16
September,	56.13	69.72	61.80	62.55
October,	38.11	54.02	45.56	45.90
Mean,	51.72	65.31	57.99	58.34

Tables Showing Changes of Temperature in the Soil for Increased Depths.

1889.

Depth of Thermometer.	Mean temperature for 6 mos., May to Oct. inclusive.	Difference in mean temperatures.	Changes in temperature for one inch.
	°	°	°
1 inch	60.50		
3 inches.....	60.77	+0.27	+0.13
6 inches.............	59.63	—1.14	—0 38
9 inches.............	58.78	—0.85	—0.28
12 inches............	58.26	—0.52	—0 17
24 inches............	56.40	—1.86	—0.15
36 inches....	54.79	—1.61	—0.13

1890.

Depth of Thermometer.	Mean temperature for 7 mos., April to Oct. inclusive.	Difference in mean temperatures.	Changes in temperature for one inch.
	°	°	°
1 inch...............	54.63		
3 inches.............	54.92	+0.29	+0.14
6 inches.............	53.96	—0.96	—0.32
9 inches....	53.26	—0.70	—0.23
12 inches............	53.31	+0.05	+0.02
24 inches............	51.96	—1.35	—0.11
36 inches............	50.77	—1.19	—0.10

1891.

Depth of Thermometer.	Mean temperature for 7 mos., April to Oct. inclusive.	Difference in mean temperatures.	Changes in temperature for one inch.
	°	°	°
1 inch...............	56.65		
3 inches.............	56.89	+0.24	+0.12
6 inches.	55.56	—1.33	—0.44
9 inches.............	54.74	—0.82	—0.27
12 inches............	54.52	—0.22	—0.07
24 inches............	52.49	—2.03	—0.17
36 inches............	51.36	—1.13	—0.09

An examination of the tables shows that the soil responds readily to the daily heat of the sun to the depth of three inches, less readily to the depth of six inches, in a moderate degree only to the depth of nine inches, and very slightly below twelve inches. To the depth of three inches the range between the morning and the midday observations has been as high as fifteen degrees. The mean daily range at the depth of 1 inch during the period of observations was 5°.55; at the depth of three inches, 4°.77; at the depth 6 inches, 2°.00; at the depth of 9 inches, 1°.09, and below 12 inches very slight.

At the depth of 3 inches, the average temperature of the soil was somewhat higher than at the depth of 1 inch. The surface soil averaged about five degrees warmer than the soil 36 inches below the surface.

The rate of reduction of temperature with depth below the layer three inches from the surface is clearly shown in the foregoing tables.

It is interesting to notice how closely the changes in temperature for one inch accord with one another, in the different years, at corresponding depths.

The apparent rate of reduction of temperature with depth is vitiated, however, by the record of the 9-inch soil thermometer. This anomalous record is explained by the fact that at the end of the first season this thermometer was broken and a new one had to be substituted in its place. The contact of the latter with the soil was not precisely the same as that of the former or of the other instruments that had not been disturbed. Judging from the tables, another year will be needed to restore uniformity of condition among the several instruments. This accident, with the resulting error introduced, well illustrates the delicacy of the work carried on by means of the soil thermometers.

Comparing soil temperatures with air temperatures during the three seasons, the following mean results appear: At the depth of 1 inch, the temperature of the soil was lower than that of the air by 2°.16; at the depth of 3 inches, by 1°.89; 6 inches, by 3°.08; 9 inches, by 3°.83; 12 inches, by 4°.06; 24 inches, by 5°.80, and at the depth of 36 inches, by 7°11.

Terrestrial Radiation.

The heat radiated from the surface of the earth during the night reduces its temperature several degrees below that of the surrounding atmosphere. The amount of this radiation or the consequent reduction of temperature is approximately shown by comparing the readings of a terrestrial radiation thermometer with those of a minimum thermometer. In obtaining data for the comparison given below, the minimum thermometer was four feet above the ground and the terrestrial radiation thermometer was within six inches of its surface. The results are based on monthly averages from May to October inclusive, 1889, from April to October inclusive, 1890, and from April to October inclusive, 1891.

Table Showing Loss of Heat by Terrestrial Radiation.

1889.

	May.	June.	July.	Aug.	Sept.	Oct.	Mean.
	°	°	°	°	°	°	°
Mean of minimum temperatures.	46.63	53.25	55.08	53.65	49 07	33.91	48.50
Mean of Temp. from Ter. Rad. Ther.	38.48	49.20	50.59	47.66	44.60	28.48	43.17
Loss of heat by radiation	8.15	4.05	4.49	5.39	4.74	5.43	5.33

1890.

	April.	May.	June.	July.	Aug.	Sept.	Oct.	Mean
	°	°	°	°	°	°	°	°
Mean of minimum temperatures	29.17	42.52	48.71	53.61	53 52	45.32	36 05	44.13
Mean of Temp. from Ter. Rad. Ther.	19.95	37.10	42.10	44.55	46.25	38.40	27.14	36.50
Loss of heat by radiation	8.22	5.42	6.61	9.06	7.27	6.92	9.91	7.63

1891.

	April.	May.	June.	July.	Aug.	Sept.	Oct.	Mean
	°	°	°	°	°	°	°	°
Mean of minimum temperatures.	30.22	37.67	49.18	53.15	54.07	49.23	34.95	44.07
Mean of Temp. from Ter. Rad. Ther.	24.45	29.09	40.87	43.94	47.40	42.22	25.60	36.23
Loss of heat by radiation	5.77	8.58	8.31	9.21	6.67	7.01	9.35	7.84

On cloudy nights the difference in the reading of the two thermometers is small, and on exceptionally clear (dry) nights it is a maximum. The greatest range observed was 19°.5. On the morning of July 2, 1889, the radiation thermometer was the higher, showing that the moist air resting upon the surface of the ground served as a warm blanket, and that the amount of heat absorbed was greater than that radiated. From the table above it appears that the mean radiation for the three seasons was 6°.93.

Solar Radiation.

The temperature of the atmosphere does not indicate the intensity of the sun's heat, as only a small percentage is absorbed as the rays are transmitted through the air. The maximum thermometer in the shade, therefore, does not give the intensity of solar radiation; neither does exposure of an ordinary thermometer to the direct rays of the sun, in consequence of the cooling effects of draughts of air. In order to avoid the effects of currents of air, the *vacuum solar radiation thermometer* has been devised. "This consists of a blackened bulb radiation thermometer inclosed in a glass tube and globe, from which all air is exhausted. Thus protected from the loss of heat which would ensue if the bulb were exposed, its indications are from 20° to 30° higher, than when placed side by side with a similar instrument with the bulb exposed to the passing air." By the use of this instrument the amounts of solar radiation at different places and in different seasons at the same place are rendered comparable. The relations of solar intensity, as distinct from temperature of the air, to the growth and maturity of crops are worthy of careful investigation. High solar intensity maintained through the latter part of the growing season has an important bearing upon the complete ripening of vegetables and fruits and likewise upon their keeping qualities. From the wide range of observations undertaken by Experiment Stations with radiation thermometers, important deductions may reasonably be expected. I subjoin tables of results from the maximum thermometer and the thermometer for solar radiation, expressed in monthly averages.

1889.

	May.	June.	July.	Aug.	Sept.	Oct.	Mean
	o	o	o	o	o	o	o
Mean of readings, Sun Ther.	133.02	134.22	139.55	137.56	122.79	105.86	128.83
Mean of maximum temperatures	67.85	73.45	75.30	73.72	71.23	52.78	69.05
Excess of solar intensity	65.17	60.77	64.25	63.84	51.56	53.08	59.78

1890.

	April.	May.	June.	July.	Aug.	Sept.	Oct.	Mean
	o	o	o	o	o	o	o	o
Mean of readings, Sun Ther.	119.15	119.45	128.81	139.37	138.25	114.94	112.52	124.65
Mean of maximum Temp.	49.37	61.16	68.01	76.53	74.67	62.32	55.61	64.38
Excess of solar intensity	69.82	58.29	60.80	62.84	63.58	49.62	56.92	60.27

1891.

	April.	May.	June.	July.	Aug.	Sept.	Oct.	Mean
	o	o	o	o	o	o	o	o
Mean of readings, Sun Ther.	106.78	119.19	129.44	140.35	129.55	121.65	99.55	120.93
Mean of maximum Temp.	50.65	62.48	72.17	76.68	75.39	69.84	54.18	65.91
Excess of solar intensity	56.13	56.71	57.27	63.67	54.16	51.81	45.37	55.02

From the above records it appears that the average excess of solar intensity above that given by the maximum thermometer for the growing periods of 1889, 1890, and 1891, was 58°.36.

The season of greatest excess in this regard was that of 1890, a season noted for the perfect maturity of fruits and vegetables.

Amount of Sunshine.

The amount of sunshine as an essential factor in crop production is worthy of observation and record. Observations were commenced May 1, 1890, and the table below furnishes the summary for the six months following and for seven months, April to November, 1891.

Bright Sunshine in Hours.

1890.

	May.	June.	July.	Aug.	Sep.	Oct.	Mean.
Sunshine,	180	186	216	193	126	133	172
Hours per day, mean,	5.8	6.2	7.0	2.6	4.2	3.3	5.6

1891.

	April.	May.	June.	July.	Aug.	Sept.	Oct.	Mean.
Sunshine,	174	207	217	259	225	234	154	209
Hours per day, mean,	5.8	6.7	7.2	8.4	7.3	7.8	5.0	6.9

During the period covered by the above table, the average hours of bright sunshine per day were 6.3 or 46 per cent. of the possible amount.

Wind and Rain.

The velocity of the wind has been determined by a Robinson's Anemometer, with electrical recording apparatus, attached to the Experiment Station building, and the amount of rain by means of a gauge, signal service pattern, located in the same plat as the soil thermometers.

1889.

	Wind.		Rain.
	Mean distance travelled per day. Miles.	Velocity per hour. Miles.	Amount. Inches.
April,	253.93	10.58	1.36
May,	189.83	7.91	1.61
June,	171.12	7.13	4.86
July,	200 33	8.34	3.27
August,	139.35	5.81	1.69
September,	198.06	8.25	2.10
October,	194.31	8.09	3.96
Mean,	192.42	8.02	Total, 18.85

1890.

	Wind.		Rain.
	Mean distance travelled per day. Miles.	Velocity per hour. Miles.	Amount. Inches.
April,	241.73	10.07	1.98
May,	235.14	9.79	10.13
June,	230.40	9.60	3.78
July,	166.28	6.95	3.84
August,	187.03	7.65	5.39
September,	155.59	6.45	4.21
October,	189.01	7.85	3.19
Mean,	200.74	8.34	Total, 32.52

1891.

	Wind.		Rain.
	Mean distance travelled per day. Miles.	Velocity per hour. Miles.	Amount. Inches.
April,	210.55	8.77	3.13
May,	206.25	8.59	2.76
June,	182.71	7.61	3.13
July,	185.44	7.73	3.36
August,	169.58	7.07	4.38
September,	162.07	6.75	3.50
October,	191.92	8.00	2.81
Mean,	186.93	7.79	23.07

For the full year 1890, the mean daily velocity of wind was 211.16 miles, and the mean hourly velocity, 8.90 miles; and for the full year 1891, the corresponding velocities were respectively 214.82 miles and 8.95 miles. The rain-fall in May, 1890, amounting to 10.13 inches, was larger than in any other month in twenty-three years.

Conclusion.

A summarized report, like that which has been presented, while in proper form for inferring laws and deducing general principles, conveys but little idea of the nature and daily requirements of the meteorological work in progress.

In order that these points may be more definitely apprehended, I append the records for one month of 1891, selecting the month of September.

An examination of the original records discloses much of interest that cannot appear in a condensed summary.

It is by the careful study of observations and records covering a considerable period of time, that general laws pertaining to this subject are discovered, and truths are revealed which are of importance to mankind.

HYGROMETER NO. 1.—IN OPEN FIELD.

September, 1891.

Day.	7 A. M.				1 P. M.				7 P. M.			
	Dry bulb.	Wet bulb.	Dew point.	Humidity.	Dry bulb.	Wet bulb.	Dew point.	Humidity.	Dry bulb.	Wet bulb.	Dew point.	Humidity.
1....	52.5	50.4	49	87	60.0	57.5	56	86	54.8	51.3	54	97
2....	52.9	52.0	51	94	64.5	59.6	57	75	61.6	60.2	60	92
3....	49.2	49.2	49.2	100	73.6	64.7	60	62	64.8	63.6	63	94
4....	63.7	62.3	62	92	72.0	61.2	54	54	66.0	63.0	61	85
5....	49.3	47.5	45	87	67.0	57.2	50	54	59.7	56.5	55	82
6....	54.0	53.0	52	94	60.2	60.2	60.2	100	60.0	60.0	60	100
7....	60.0	60.0	6	100	60.4	60.4	60.4	100	60.7	60.7	60.7	100
8....	54.3	52.3	50	88	65.0	57.1	51	61	57.0	52.0	48	71
9....	46.2	45.0	44	91	65.0	55.7	48	55	60.0	53.5	48	65
10....	51.9	50.8	50	94	68.9	58.4	51	53	58.8	55.3	53	81
11....	54.6	54.0	54	97	72.8	60.3	52	48	64.3	60.1	57	78
12....	49.7	49.7	49.7	100	63.6	56.8	52	66	60.6	59.0	59	92
13....	59.8	59.0	58	95	61.8	57.2	54	76	62.0	60.1	59	89
14....	60.0	60.0	60	100	64.0	62.0	61	90	64.4	57.2	52	64
15....	48.4	47.0	45	89	57.7	51.2	46	64	54.3	50.3	46	76
16....	39.4	39.1	38	98	65.1	56.3	49	57	60.0	55.8	53	77
17....	51.5	50.5	50	94	68.4	58.8	52	56	58.9	56.8	56	89
18....	60.2	59.6	59	97	74.2	70.0	68	82	67.6	67.6	67.6	100
19....	55.8	52.3	50	80	67.7	61.7	58	71	66.0	61.0	58	75
20....	55.0	53.0	52	88	70.3	65.9	63	79	58.0	55.8	55	88
21....	57.8	57.0	56	95	74.3	69.2	67	78	63.1	61.1	60	89
22....	57.0	56.3	56	96	72.7	66.8	64	73	62.0	61.0	60	95
23....	56.0	56.0	56	100	71.8	61.2	55	55	59.8	57.9	57	89
24....	50.0	47.3	45	82	62.8	58.0	55	75	61.0	59.0	58	89
25....	58.5	58.5	58.5	100	64.8	72.0	66	54	73.0	68.0	66	78
26....	60.3	55.2	51	73	69.3	56.7	47	45	65.0	57.2	51	62
27....	51.7	51.0	51	96	72.8	62.1	56	54	58.5	54.0	51	75
28....	55.0	55.0	55	100	76.0	69.2	66	71	62.0	60.5	60	92
29....	62.0	61.0	60	95	73.0	67.0	64	73	65.1	63.0	62	90
30....	53.0	45.2	36	53	59.0	48.2	37	44	51.5	47.2	43	73
Means.................				.92				.67				.84
Mean for month.. 0.81												

HYGROMETER NO. 2.—IN OPEN FIELD.

SEPTEMBER, 1891.

Day.	7 A. M.				1 P. M.				7 P. M.			
	Dry bulb.	Wet bulb.	Dew point.	Humidity.	Dry bulb.	Wet bulb.	Dew point.	Humidity.	Dry bulb.	Wet bulb.	Dew point.	Humidity.
1....	54.5	52.7	52	89	63.1	59.6	57	82	55.9	55.2	55	96
2....	53.6	52.8	52	95	65 9	60.0	56	71	62.7	61.0	61	91
3....	52.7	52.7	52.7	100	74.2	65.1	60	62	65.3	63.9	63	92
4....	65.0	63.2	62	91	75.5	69.0	66	72	67.0	64.0	62	85
5....	53.6	52.0	51	91	69.8	59.8	53	55	59.8	56.2	54	81
6....	54.7	53.5	53	93	61.3	61.3	61.3	100	60.7	60.7	60.7	100
7....	60.6	60.6	60.6	100	60.8	60.8	60.8	100	60.8	60.8	60.8	100
8....	57.8	55.0	53	84	66.0	57.3	51	58	57.0	52.2	48	72
9....	48.6	46.7	45	86	66.8	56.3	48	51	60.0	53.2	47	64
10....	55.4	54.2	53	93	70.0	59.7	52	54	61.7	57.7	55	79
11....	57.2	56.3	55	94	73.6	61.7	54	50	66.3	62.0	59	79
12....	53.0	52.3	52	96	65.4	56.9	50	59	62.3	60.6	60	91
13....	60.2	59.0	58	93	63.7	58.6	56	74	62.5	61.0	61	92
14....	60.5	60.5	60.5	100	65 6	63.4	63	89	61.8	58.6	57	83
15....	49.8	48.5	47	91	59.7	54.0	50	69	55.8	52.6	51	81
16....	44.9	44.9	44.9	100	67.9	59.4	51	60	61.2	57.1	54	78
17....	57.0	55.3	55	90	73.2	68.4	66	79	60.2	58.2	57	89
18....	61.2	60.8	60	97	76.5	73.2	72	86	68.2	68.2	68.2	100
19....	55.8	52.8	51	82	68.4	61.2	57	66	64.2	59.0	56	73
20....	60.3	57.2	55	84	74.3	63.8	57	56	58.7	57.0	57	91
21....	60.0	59.0	58	94	75.4	71.0	68	80	63.7	62.0	52	91
22....	57.8	57.0	56	95	74.0	68.8	67	77	62.8	61.2	61	92
23....	56.7	56.7	56.7	100	72.6	61.9	56	54	57.2	56.0	55	93
24....	50.0	47.0	44	80	65.2	60.0	57	74	61.8	59.5	58	88
25....	59.0	59.0	59	100	85.0	72.3	66	54	73.5	68.0	66	76
26....	60.3	55.9	52	75	69.9	57.2	48	45	63.7	56.0	51	61
27....	52.8	51.3	50	91	75.3	64.7	58	56	61.2	56.8	53	76
28....	55.0	55.0	55	100	78.6	70.8	67	69	61.7	60.4	60	93
29....	62.1	61.6	61	97	75.0	68.3	65	71	65.6	63.7	63	90
30....	53.7	46.4	39	57	59.0	49.9	39	47	50.8	46.3	42	71
Means................				.91				.67				.85
Mean for month........											0.81	

HYGROMETER NO. 3—IN FOREST.

SEPTEMBER, 1891.

Day.	7 A.M.				1 P.M.				7 P.M.			
	Dry bulb.	Wet bulb.	Dew point.	Humidity.	Dry bulb.	Wet bulb.	Dew point.	Humidity.	Dry bulb.	Wet bulb.	Dew point.	Humidity.
1....	46.9	45.4	44	89	57.5	55.0	54	86	52.8	52.8	52.8	100
2....	50.3	49.8	49	97	62.3	59.1	57	83	59.7	59.0	59	96
3....	48.7	48.7	48.7	100	70.0	64.6	61	74	62.9	61.7	61	94
4....	62.6	42.0	62	97	70.2	68.2	67	90	65.2	64.5	64	96
5....	50.0	49.0	48	93	61.2	68.6	57	87	60.4	59.2	58	93
6....	54.0	53.7	53	98	58.7	58.7	58.7	100	59.3	59.3	59.3	100
7....	59.5	59.5	59.5	100	59.7	59.7	59.7	100	59.8	59.8	59.8	100
8....	52.8	52.2	52	96	62.0	59.1	57	84	57.9	56.4	56	91
9....	43.3	42.8	42	96	61.7	57.8	55	79	59.1	56.3	54	84
10....	48.3	48.0	47	98	64.0	59.8	57	78	59.8	58.3	58	92
11....	49.6	49.3	49	99	66.7	61.2	58	73	64.0	61.8	61	89
12....	49.9	49.0	48	93	59.6	54.2	50	70	57.8	57.0	56	95
13....	57.6	57.2	57	97	58.6	55.2	53	81	62.3	61.5	60	96
14....	60.3	60.0	59	98	61.8	61.8	61.8	100	59.0	58.2	57	95
15....	48.1	47.8	47	98	56.8	51.9	48	71	55.5	53.3	53	87
16....	41.5	41.3	41	98	58.6	54.0	51	75	57.0	55.4	55	91
17....	49.3	48.3	42	92	62.8	59.2	57	82	60.2	58.2	57	89
18....	59.0	58.2	57	95	71.8	69.2	69	88	65.4	65.4	66.4	100
19....	55.2	53.0	52	87	63.2	55.3	49	60	61.0	57.4	55	81
20....	48.9	48.3	48	96	64.0	59.0	56	74	59.5	59.0	59	97
21....	56.0	55.0	54	94	67.9	65.1	63	86	63.0	62.3	62	96
22....	56.8	56.0	55	95	64.9	62.7	62	89	63.0	61.2	60	90
23....	55.8	55.8	55.8	100	67.8	63.3	61	78	59.3	57.0	55	87
24....	49.3	48.1	47	92	60.0	58.0	57	89	58.3	57.0	56	92
25....	47.7	47.7	47.7	100	79.2	72.2	69	71	74.5	71.0	70	84
26....	60.4	57.0	54	81	65.8	58.2	53	63	62.9	58.8	56	79
27....	50.6	50.3	50	98	67.9	62.1	58	72	57.8	55.6	55	88
28....	54.4	54.4	54.4	100	70.8	68.0	67	87	61.5	60.0	60	92
29....	61.3	60.6	60	96	71.1	68.0	67	86	65.4	63.8	63	92
30....	51.6	50.0	49	90	58.0	51.0	45	61	52.0	49.0	46	81
Means..................				.95				.81				.92
Mean for month..											0.89	

HYGROMETER NO. 4—IN FOREST.

SEPTEMBER, 1891.

Day.	7 A.M.				1 P.M.				7 P.M.			
	Dry bulb.	Wet bulb.	Dew point.	Humidity.	Dry bulb.	Wet bulb.	Dew point.	Humidity.	Dry bulb.	Wet bulb.	Dew point.	Humidity.
1....	47.0	45.8	45	92	57.7	54.9	53	84	53.5	53.5	53.5	100
2....	50.1	49.4	49	96	62.7	59 2	57	82	60.6	59.8	59	95
3....	47.6	47 6	47.6	100	69.3	64.0	60	75	63.4	62.1	61	93
4....	63.0	62.2	61	96	71.2	67.3	65	81	66.8	64.8	64	95
5....	50.0	48.8	48	92	62.3	57.5	53	75	60.0	59.0	58	94
6....	54.2	53.8	53	97	59.0	59.0	59	100	59.1	59.1	59.1	100
7....	59.8	59.8	59.8	100	59.7	59.7	59.7	100	59.8	59.8	59.8	100
8....	53.1	52.4	52	96	60.2	59.0	58	94	58.3	57.0	56	92
9....	44.0	43.3	43	95	60.6	56.0	53	76	57.0	55 1	54	88
10....	48.3	48.0	47	98	63.8	59.5	56	78	58.6	56.7	56	89
11....	49.9	49.4	49	97	67.5	61.5	58	71	63.6	61.5	61	90
12....	49.8	49.0	48	94	60.0	54.6	50	70	58.3	57.4	56	94
13....	57.8	57.3	57	97	60.1	55.5	52	75	62.5	61.5	61	95
14....	60.5	60.0	60	97	61.8	61.6	61	99	57.8	57.2	57	97
15....	47.5	47.1	47	96	56.3	53.2	51	82	53.2	51.8	50	91
16....	41.0	40.8	40	99	58.2	53.4	49	73	56.8	55.5	55	92
17....	49.8	48.9	48	93	63.7	59.3	56	77	59.1	57.0	56	89
18....	60 0	59.1	58	94	73.2	70.0	69	85	65.8	65.8	65.8	100
19....	54.2	52.8	51	91	64.2	56.7	51	62	61.3	57.8	55	81
20....	49.8	49.1	49	96	65.8	60.0	56	72	58.8	58.3	58	97
21....	56.2	55.9	55	98	68.8	65.2	63	83	63.2	62.4	61	96
22....	56.5	56.0	56	97	65.6	63.3	62	88	63.8	62.0	61	91
23....	56.4	56.4	56.4	100	68.2	63.0	60	75	57.8	56.6	56	93
24....	50 0	48.9	48	93	62.0	59.0	57	84	59.8	58.3	58	92
25....	48.0	48.0	48	100	79.0	71.4	68	70	72.5	69.0	68	84
26....	60.0	57.0	55	84	66.9	58.0	52	58	62.0	58.2	55	80
27....	51.0	50.6	50	97	70.1	63.1	59	68	58.0	55.9	55	89
28....	54.7	54.7	54.7	100	72.7	69.0	68	83	61.3	59.8	59	92
29....	62.0	61.3	61	96	72.4	68.0	65	79	65.3	64.8	64	97
30....	51.8	50.0	48	88	58.0	50.3	43	58	51.4	49.2	47	86
Means................				.96				.79				.92
Mean for month..											0.89	

SOIL THERMOMETERS.

1891. September.	1 inch.			3 inches.			6 inches.			9 inches.			12 inches.			24 inches.			36 inches.		
Day.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.	7 A.M.	1 P.M.	7 P.M.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1	59.0	61.8	60.8	59.3	62.0	61.5	60.0	60.8	63.0	60.5	61.3	62.0	61.0	61.5	62.0	61.7	61.5	61.3	60.0	60.0	60.0
2	58.5	66.5	63.4	59.0	67.2	64.0	59.5	63.7	62.5	61.5	62.0	63.3	62.0	62.5	62.3	61.2	61.0	61.0	59.8	59.8	59.5
3	57.5	65.9	64.0	58.7	66.7	64.5	59.3	65.4	64.8	61.3	62.5	63.0	61.8	62.5	62.8	60.8	60.7	60.7	59.5	59.4	59.4
4	63.0	67.8	66.8	62.7	67.0	66.3	63.0	64.2	65.3	62.5	63.0	64.8	62.5	62.5	62.8	60.5	60.5	60.5	59.4	59.3	59.3
5	60.3	64.8	64.5	60.5	64.2	64.5	62.6	62.3	63.0	63.3	62.0	62.5	63.0	62.5	62.5	60.7	60.7	60.7	59.1	59.3	59.2
6	61.0	61.5	61.5	61.0	61.5	61.7	62.0	61.7	61.9	62.0	62.0	61.9	62.3	62.2	62.1	60.6	60.6	60.6	59.1	59.2	59.2
7	61.5	61.9	61.7	62.0	62.0	61.5	62.0	61.8	61.5	61.7	61.5	61.3	62.0	61.8	61.7	60.5	60.5	60.5	59.3	59.3	59.3
8	58.8	63.5	62.0	59.0	63.6	62.0	60.5	61.0	62.0	60.7	60.6	61.5	61.5	61.0	61.0	60.5	60.5	60.3	59.3	59.3	59.3
9	55.0	61.3	61.0	55.2	61.3	61.3	58.0	58.5	60.1	59.5	59.0	60.0	60.5	59.8	59.7	60.2	60.2	60.0	59.0	59.1	59.0
10	55.5	62.5	61.7	55.9	62.0	61.9	58.2	59.0	61.0	59.0	58.9	60.2	59.5	59.3	59.6	59.7	59.7	59.6	59.0	59.0	58.9
11	57.0	64.7	63.5	57.0	64.5	64.0	58.7	60.8	62.0	59.4	60.3	61.0	59.7	59.8	60.0	59.5	59.5	59.4	58.8	58.8	58.8
12	58.0	61.5	60.8	58.0	62.0	61.3	59.7	61.8	61.0	60.0	61.2	61.0	60.3	60.8	61.0	59.4	59.5	59.4	58.5	58.7	58.7
13	58.6	62.9	63.0	59.5	61.5	63.0	59.0	60.8	62.5	60.8	61.3	61.5	61.0	61.0	61.0	59.5	59.5	59.5	58.5	58.7	58.5
14	61.5	61.9	63.0	61.5	63.2	62.9	61.5	61.8	62.4	61.2	61.5	61.8	61.0	61.3	61.3	59.5	59.7	59.7	58.5	58.7	58.5
15	58.3	59.5	59.1	57.8	59.3	59.5	59.7	59.2	59.9	60.5	59.7	60.0	61.0	59.4	60.0	59.7	59.7	59.5	58.4	58.5	58.4
16	54.1	59.7	60.5	54.4	59.7	60.7	56.1	58.3	59.8	58.2	57.8	59.0	59.1	58.8	58.7	59.4	59.4	59.2	58.3	58.5	58.3
17	55.7	61.1	61.8	56.0	61.2	62.2	57.9	59.0	61.2	58.5	58.3	59.9	60.0	58.8	59.0	58.9	59.0	58.8	58.3	58.3	58.2
18	59.4	64.8	65.0	59.5	64.3	64.7	59.7	61.2	62.4	59.6	60.0	60.6	59.6	59.7	59.7	58.7	58.9	59.0	58.2	58.2	58.2
19	59.8	61.4	61.8	60.2	61.6	61.9	61.5	60.9	61.7	61.5	60.8	61.0	61.0	60.8	60.7	58.8	59.3	59.2	57.8	58.2	58.1
20	56.0	61.5	60.8	56.0	61.3	61.0	57.7	58.5	60.6	58.7	58.5	59.9	59.8	59.3	59.5	59.1	59.1	59.0	58.1	58.0	58.0
21	58.5	63.7	60.5	58.8	63.5	61.4	59.5	60.8	60.8	59.5	59.6	60.3	59.5	59.7	59.7	58.8	59.0	59.0	58.0	58.0	58.0
22	61.0	64.5	64.0	60.7	64.2	64.0	61.1	62.0	63.0	61.0	61.0	61.8	60.5	60.5	61.0	59.0	59.0	59.0	58.0	58.0	58.0
23	60.5	64.2	62.8	60.5	64.0	62.8	62.5	62.0	62.8	62.0	61.0	61.8	60.7	61.0	61.3	59.1	59.3	59.3	58.0	58.0	58.0
24	57.5	59.5	60.5	67.5	59.3	60.5	59.5	59.2	60.2	60.0	58.5	59.5	60.5	60.0	59.8	59.3	59.3	59.2	58.0	58.0	58.0
25	59.3	65.3	65.8	59.3	64.6	65.8	59.5	61.0	64.3	59.5	60.0	61.5	59.5	59.8	60.5	59.0	59.0	59.0	58.0	58.0	58.0
26	62.1	63.3	63.3	62.3	63.8	63.7	62.5	62.3	63.0	62.0	61.8	62.1	61.4	61.4	61.4	59.0	59.3	59.3	58.0	58.0	58.0
27	57.2	62.3	61.5	57.0	62.5	61.8	59.2	60.0	61.5	60.0	60.0	60.5	60.5	59.3	60.2	59.5	59.5	59.3	58.0	58.0	58.0
28	59.5	63.5	65.5	59.8	63.5	63.7	60.0	60.0	63.0	60.2	59.1	60.5	60.2	59.5	60.3	59.3	59.3	59.2	58.0	58.0	58.0
29	61.5	65.0	64.3	61.5	65.0	64.5	61.5	62.1	63.4	61.0	61.0	62.1	60.5	60.9	61.3	59.0	59.0	59.2	58.0	58.0	58.0
30	59.0	58.5	57.5	59.3	59.0	57.8	61.1	59.5	59.5	61.5	60.2	60.0	61.3	60.7	60.0	59.1	59.3	59.2	58.0	58.0	58.0
Means.	58.82	62.88	62.41	59.00	62.85	62.55	60.43	60.99	62.00	60.51	60.48	61.21	60.77	60.60	60.73	59.67	59.70	59.65	58.53	58.61	58.36

SEPTEMBER, 1891.

Day	Maximum and Minimum Thermometers and Record of Sunshine. Maximum.	Minimum.	Hours of Sunshine.	Terrestrial Radiation and Sun Thermometer. Terrestrial Radiation.	Sun Thermometer.	Precipitation. Time of beginning.	Time of ending.	Amount of rain in inches.	Anemometer observed at 1 P.M. Reading.	Number of miles in last twenty-four hours.	Average rate per hour.
	°	°		°	°						
1	61.7	50.3	0	43.6	104.6	1.45 P.M.	Night	.21	847.3	157.1	5.71
2	68.9	50.7	13	41.5	133.8				951.5	104.2	4.34
3	77.0	46.5	13	38.7	135.1				985.8	34.3	1.43
4	71.9	48.8	6	41.3	132.8				342.5	346.7	14.45
5	66.3	48.1	6	42.5	129.2				553.0	210.5	8.77
6	62.5	53.4	0½	48.9	79.1	early a.m			602.4	49.4	2.78
7	62.8	57.8	0	51.2	71.6		8.30 P.M.	2.25	662.4	60.0	2.50
8	67.3	49.9	8	41.8	139.0				881.1	218.7	9.11
9	68.0	39.3	8½	28.8	127.0				42.5	151.4	6.31
10	72.0	43.8	12½	32.3	135.1				173.2	130.7	5.45
11	76.1	43.9	12½	37.3	135.0				277.5	104.3	4.35
12	65.7	45.0	12½	38.8	134.7				335.5	58.0	2.42
13	60.8	43.8	0	39.2	82.3	9.45 P.M.	Night	.10	629.4	293.9	12.25
14	72.3	57.8	6	44.6	119.6	11.15 A.M.	1 P.M.	.60	773.2	143.8	5.99
15	62.5	45.9	9	36.5	119.0				957.8	184.6	7.69
16	68.0	38.2	12	31.4	125.1				36.6	68.8	2.87
17	71.9	44.3	12	38.5	122.5				101.3	64.7	2.70
						early a.m	6 A.M.	.05	301.5	200.2	8.34
18	75.4	53.2	3	50.5	118.2	5 P.M.	7 P.M.	.17	625.2	323.7	13.49
19	70.7	54.5	12	50.4	124.9				708.3	83.1	3.46
20	71.0	37.8	12	27.5	123.8				792.6	84.3	3.51
21	74.3	54.0	5	48.0	137.2	2 P.M.	7 P.M.	.10	841.3	48.7	2.29
22	68.8	55.6	0	53.8	110.3				971.5	130.2	5.43
23	73.0	53.5	9	50.5	133.7				145.5	164.0	6.83
24	64.0	44.2	3	36.3	115.3				353.6	208.1	8.67
25	86.0	56.9	12	52.2	133.9				616.0	262.4	10.93
26	73.3	59.9	11	53.9	125.6				723.7	107.7	4.49
27	73.0	40.1	12	34.5	129.8				874.3	150.6	6.28
28	76.2	49.0	9½	39.7	130.0				154.6	270.3	11.25
29	73.9	60.0	3	52.0	130.3	Night	Night	.02	622.4	467.8	19.49
30	60.0	50.7	11½	40.5	111.0						
		Total,	234½				Total,	3.50	Total,	4862.2	
M'ns	69.84	49.23	7.8	42.22	121.65					162.07	6.75

Report of Botanist and Entomologist.

PROF. F. L. HARVEY.

The following subjects have claimed attention during the past season:

BOTANY.

1. Germination experiments on the vitality of seeds, continued.
2. *Datura Stramonium*, L. Jamestown Weed. Described.
3. *Raphanus raphanistrum*, L. White Radish, or Jointed Charlock.
4. *Rumex crispus*, L. Yellow Dock.
5. *Rumex obtusifolius*, L. Bitter Dock.
6. *Bromus secalinus*, L. Chess or Cheat, considered and illustrated.
7. Several species of Mosses studied in reference to their value as foods for domestic animals.
8. Continuation of an examination of Potato Rot.
9. Continuation of an examination of Black Knot.
10. Correspondence regarding weeds, seeds and plants.
11. Examination of Seeds for impurities.
12. Collecting of seeds, weeds, forage and other plants for the herbarium, continued.

ENTOMOLOGY.

13. *Ixodes ricinus*, L. Tick.
14. *Smerinthus geminatus*, Say. Sphinx moth.
15. *Treptogon modesta*, Harris. Sphinx moth.
16. *Sphinx gordius*, Cramer. Sphinx moth.
17. *Agrostis saucia*, Hubner. Climbing cut-worm.
18. *Agrostis Ypsilon*, (Rott.) Greasy cut-worm.
19. *Hadena devastatrix*, (Brace.) Glassy cut-worm.
20. *Apatela lepusculini*, Gue. The Cotton Dagger.
21. *Aphonus tridentata*, Say. Three-toothed Aphonus.
22. *Dytiscus verticalis*, Say.
23. Three species of Rove Beetles.
24. *Elaphidion parallelum*, Newm.
25. *Ptinus brunneus*, Duft.
26. *Aphis mali*, Fabr. Apple Aphis.
27. *Cotalpa lanigera*, (Linn.) Gold-smith Beetle.
28. *Tetranychus 4-maculata*, n. sp. Four spotted mite.

Plants Received for Examination—1891.

WEEDS.

No.	Common Name.	Scientific Name.	From whom Received.	Remarks.
1	Jamestown weed.	Datura Stramonium, L.	Several parties.	Weed in gardens.
2	White Radish, or Jointed Charlock.	Raphanus raphanistrum, L.	A. J. Abbott, West Paris, Me.	Pods abundant in Western oats shipped to Maine.
3	Yellow Dock.	Rumex crispus, L.	Various parties.	Weed in waste ground, fields and gardens.
4	Bitter Dock.	Rumex obtusifolius, L.	Various parties.	Weed in waste ground, fields and gardens.
5	Chess, or Cheat.	Bromus secalinus, L.	Mr. F. V. Barker, Athens, Me.	Weed on the farm.

MOSSES.

No.	Common Name.	Scientific Name.	From whom Received.	Remarks.
6	Bog Moss.	Sphagnum cymbifolium, Ehrb.	Henry A Sprague, Charlotte, Maine.	Sent for determination and for an examination as to nutritive value for feeding domestic animals.
7	Bear's Bed, or Robin's Rye.	Polytrichum Juniperinum, Hedw.		
8	Splendid Hypnum.	Hypnum Splendens, Hedw. H. proliferum, L.		
9	Schreber's Hypnum.	Hypnum Schreberi, Willd.		
10	Reindeer moss—a lichen.	Cladonia rangiferina.	Collected at Orono.	Analyzed for comparison.

LIST OF INSECTS REPORTED AND EXAMINED—1891.

No.	Common Name.	Scientific Name.	By whom Reported.	Remarks.
1	Tick.	Ixodes ricinus, L.	Thos. Lord, Skowhegan, Me.	Infesting domestic cat.
2	Sphinx Moth.	Smerinthus geminatus, Say.	W. N. Bond, Orono, Me.	About apple trees.
3	Sphinx Moth.	Triptogon modesta, Harris.	Q. E. Young, Costigan, Me.	Habit not reported. Food plants, poplar and cottonwood.
4	Sphinx Moth.	Sphinx gordius, Cramer.	L. E. Fogg, S. Thomaston, Me.	Said to be feeding on the foliage of plum trees. Not abundant.
5	Climbing Cut-worm.	Agrostis saucia, (Hubner).	W. K. Burgess, Monroe, Me.	The eggs of this in abundance were found attached to resined cloth used for grafting.
6	Greasy Cut-worm.	Agrostis Ypsilon, (Rott.)	N. H. Sleeper, Lewiston, Me.	Working in corn, potatoes and beans.
7	Glassy Cut-worm.	Hadena devastatrix, (Brace.)	John M. S. Hunter, Farmington, Me. N. H. Sleeper, Lewiston.	Doing great damage in lawn of public building, and to corn.
8	The Cottonwood Dagger.	Apatela lepusculini, Gue.	W. H. Phinney, Standish, Me.	Upon plantain in door yard.
9	Three-toothed Aphonus.	Aphonus tridentatus, Say.	N. H. Sleeper, Lewiston, Me. C. V. Manley, Auburn, Me.	Accused of cutting off corn below ground.
10		Dytiscus verticalis, Say.	F. H. Skinner, Corinth, Me.	Found in cellar among potatoes.
11	Rove Beetles.	Three species.	W. K. Burgess, Monroe, Me.	Abundant fastened to resined cloth used for grafting.
12	The Parallel Elaphidion.	Elaphidion parallelum, Newm.	W. K. Burgess, Monroe, Me.	Boring in plum twigs.
13		Ptinus brunneus, Duft.	Mrs. E. Gardner, Calais, Me.	Live larva and beetles in red pepper.
14	Gold-smith Beetle.	Cotalpa lanigera, Linn.	Allen Reed, Frye, Me.	Habitat not stated.
15	Apple Aphis.	Aphis mali, Fabr.	Ch. H. Pope, Manchester, Me.	Feeding on raspberry bushes.

REMARKS.

Those of the above named plants and insects that have been sufficiently studied, or are of enough importance receive consideration below. The plates and cuts to illustrate this Report were obtained from the following sources: From the Dept. of Agric., Washington, D. C., the plate of *Bromus secalinus;* cuts 1, 2, 3, 4, 6, 7 and 10 from J. B. Lippincott & Co., and are after cuts in Saunder's Insects Injurious to Fruits; cuts 5, 8, 11, 12 and 13 were kindly loaned by Prof. S. A. Fobes and are after cuts in the Ill. Repts.; cut 9 is from a drawing made by the writer.

During the past season the writer assumed alone the botanical and entomological work of the Station, but Mr. F. P. Briggs, Assistant in the Natural History Department of the College, has continued in an efficient manner the germination experiments and collecting for the herbarium.

The appointment of a Station Horticulturist has transferred the work of the Botanist and Entomologist largely to the study of life histories of plants and insects found doing injury in the State. The Horticulturist has assumed the work of testing fungicides and insecticides. Insects and plants for identification and questions regarding their habits will be considered by the writer, but questions regarding spraying and spraying apparatus should more properly be referred to Prof. Munson. We take this occasion to say that any one desiring information regarding insects or plants is at liberty to send specimens or ask questions. We are glad to notice an increasing demand for such information. Directions for sending specimens will be found in Experiment Station Report, 1888, p. 194.

The past season has not been characterized by the wide spread occurrence of any one species of fungus or injurious insect. The ravages of the Forest-tent Caterpillar, so serious and threatening in 1890, amounted to almost nothing the past season, as we predicted would be the case in our last Report. The past season was quite wet and many complaints were received of injuries done by various species of cut worms. The Codling Moths and Apple Maggot were as abundant as usual in some sections of the State. There seems to be an awakening to the importance of spraying for Apple Scab and the Codling Moth, as more inquiries have been received than usual regarding fungicides, insecticides and apparatus. Complaints from two sources were received of injuries done to corn by *Aphonus tridentatus*, Say. This insect has never before been accused of cutting corn in the hill after the manner of a cut worm. Our attention has been directed the past season to a species of mite which is common on house plants in Orono, and also in the forcing house at the College. This is the same species that has done so much damage at Cornell University and elsewhere in green houses. It seems to be wide spread and a serious pest. It is very closely related to the red spider, being a species of *Tetranychus*. There were some newspaper reports of the appearance of the Gypsey Moth in the western part of the State, but we are not able to find any authentic evidence that it is found in the State. The Fall Canker-worm has been gradually increasing in the Penobscot valley for the past four years. Last season it did considerable damage to the foliage of fruit and shade trees in this vicinity and numerous eggs were laid last fall. It may be expected to give some trouble the coming season. Spraying with Paris green while the worms are young, is the remedy. The Apple Scab seems to be the most injurious fungus the orchardists have to contend with, but the use of copper compounds will no doubt prove an efficient remedy.

It may be well to state that the new Tachinid referred to in the Expt. Station Report, 1890, p. 139, as parasitic upon the Forest-tent Caterpillar and named *Phorocera promiscua*, Townsend, has since been referred by the same author to the genus *Meigenia*, and should now be called *Meigenia promiscua*, Townsend. See Psyche, Nov., 1891, p. 177.

BOTANY.

JAMESTOWN WEED—THORN APPLE.

Datura Stramonium, L.

Specimens of the above species have been handed to us for determination several times during the past five years. We have observed the plant several times as a weed in gardens about Orono, and it may be common throughout the State. Whether introduced in garden or grass seed we do not know. Though it appears from year to year in this region, yet being a tropical plant it would probably not spread. It is a native of *Asia* introduced in America. In the South it grows several feet high and is a rank weed found about barns and out houses where the soil is rich, or in fields and along road sides. The seeds are officinal and constitute the *Stramonium* of the druggist. In the South the seeds are pulverized and mixed with lard to form an ointment much used for healing sores. The plant may be known by the long, funnel-shaped, white corolla, with a large five to ten toothed plaited border; the large, globular, prickly seed pod, four celled at the bottom; the large, flat seeds, and the ovate, ill-scented foliage. The flowers are borne on short peduncles in the forks of the branching stems. The plant is a member of the order *Solonaceœ* to which the potato, tomato and tobacco belong. It is closely related to *Datura* (Brugmansia) *arborea*, a shrubby plant bearing white *Datura*-like blossoms fully six inches long and grown as a house plant in Maine and called *Wedding Bell*. Those who have access to the U. S. Agr'l Rept. for 1889, will find this plant figured on Pl. VII in the Report of the Botanist.

White Radish or Jointed Charlock.

Raphanus raphanistrum, L.

The following letter from Mr. Abbott, together with the response, being of general interest, are recorded.

West Paris, Me., Jan. 2, 1890.

W. H. Jordan.

Dear Sir:—I send you some oats with which are some seeds that are new to me. Can you tell me what they are? They are Western oats such as are brought here by the car load for feed.

Very Respectfully,

A. J. ABBOTT.

Response.

Orono, Me., Jan. 9, '91.

Mr. A. J. Abbott,

West Paris, Me.

Dear Sir:—Your letter and package were handed me by Prof. Jordan for consideration. The foreign matter in the oats sent consists of the pods and included seeds of *Raphanus Raphanistrum*, *L*. The Wild Radish or Jointed Charlock. The plant yielding these pods is a troublesome weed in Eastern New England and farther west. It is a near relative of the garden Radish, *Raphinus sativus*, *L*, and was introduced from Europe. This plant belongs to the Order *Cruciferœ* or *Mustard Family*. The pods are necklace-formed and break into joints by constrictions between the seeds, as shown by the specimens sent. By examining the joints of the pods, you will find the *brownish spherical* seeds. What the physiological effects of eating so much radish seed would be upon animals I cannot say, but as the seeds of some *cruciferous plants* yield an irritating pungent oil, the effect would probably be like that of mustard seed, laxative and stimulating to the digestive organs. This effect would not be desirable in healthy animals. The radish seed, though an adulteration, would have some nutritive value. Clean oats would be preferable and this adulteration ought to make them of less market value. Such oats should not be used as seed, as this bad weed would be introduced whereever they were sown. It would not be possible to feed such oats on the farm without introducing the weed. We would advise farmers not to buy them. The weed is already in the State, being rather common about Orono. Care should be taken not to further extend it. It may be said in its favor, that it is an annual; and could be eradicated in one season, by careful tillage. We would like to know whether the oats received from the West are often thus adulterated or whether this is the first time you have seen it. I wish you would send me a quart of the seed adulterated just as taken from the car. I want to determine the per cent. of foreign matter and keep the sample for the museum.

Yours very truly,

F. L. Harvey,

Botanist for the Station.

Yellow Dock and Bitter Dock.

Rumex crispus, L, *and Rumex obtusifolius*, L.

The above species sent for determination are common weeds in fields, gardens and waste ground. They are naturalized from Europe. The Curled Dock is smooth, has lanceolate acute leaves with the margins strongly wavy curled. The lowest leaves truncate or scarcely heart-shaped at the base. The flowers in crowded whorls on a long wand-like raceme. The valves (three inner sepals) round, heart shaped with an obscure toothed or entire border and nearly all grain bearing.

The Bitter Dock has a rough stem, the lowest leaves ovate heart-shaped and obtuse. Flowers in loose, distinct whorls. The valves strongly veined, ovate shield-shaped with sharp, awl-shaped teeth at the base. Only one usually grain bearing.

These plants belong to the order *Polygonaceæ* or Buckwheat Family, and are related to the smart weeds and the cultivated buckwheat. They are figured in the U. S. Agr'l Rept., 1889, Pl. VIII and IX in the Rept. of the Botanist.

Those interested in the species of *Rumex* (docks) occurring in the United States, will find all the species considered (about twenty) and finely illustrated in the Third Annual Report of the Mo. Bot. Garden, in an article from the pen of Prof. Wm. Trelease, Director, St. Louis, Mo.

CHESS, OR CHEAT. (*Bromus secalinus*, L.) MARX.DEL.

CHESS, OR CHEAT.

Bromus secalinus, L.

A letter containing specimens of the above named grass was received from Mr. F. V. Barker, Athens, Me., who stated that the plant grew on his farm and he wished to know whether it was of any value. The following response may be interesting in connection with the cut we give of this species on the opposite page.

ORONO, ME., Dec. 10, '91.

MR. F. V. BARKER,

ATHENS, ME.

Dear Sir:—The specimen of grass you forwarded to Prof. Balentine has been handed to me for examination. It is Chess or Cheat, known to botanists by the name *Bromus secalinus*, L. Some farmers still hold to the old tradition that Chess is a degenerate wheat, but most now know it is a distinct species, which sometimes overruns grain fields. The seed is sometimes sown with the grain, but more often gets in from neglected fence corners or hedge rows. It is a very hardy, coarse plant, that seeds profusely and would soon overrun a field if not checked. It is an annual, hence careful cutting for one season would eradicate it. It is of no value to the farmers of Maine, though it has been suggested as a winter grass for the South, where some of its near relatives are esteemed. It is rather to be regarded as a weed and should be destroyed. It is not a native grass, but was introduced from Europe. It may be recognized by the aid of the accompanying cut and the following description: Flowering glume oblong, convex on the back; flowers lapping over one another before expanding; lower empty glume distinctly 3—5 nerved, the upper 5—9 nerved, annual; panicle spreading, even in fruit, the drooping peduncles little branched; spikelets oblong-ovate, turgid, smooth, of 8—10 flowers; glume rather longer than the palet, short awned or awnless; sheaths nearly glabrous. Growing in fields or waste places as though introduced.

Respectfully,

F. L. HARVEY,

Botanist for the Station.

Examination of Mosses.

L. H. Merrill and F. L. Harvey.

The following letter was received at the Experiment Station last fall.

CHARLOTTE, ME., NOV. 30, 1891.

MESSRS. OF THE EXPERIMENT STATION.

Dear Sirs:—As the U. S. Agr'l. Repts. and Bentley's Botany, state that some mosses are rich in nutriment, and as our school text books skip these cryptogams, I send you three specimens for examination, which I hope you will report upon to me as soon as convenient.

No. 1 is found in large quantities covering mossy low bogs with a soft cushion from six to eighteen inches thick. If *scalded* and mixed with a very little *corn meal* it is eaten with apparent relish by swine.

No. 2 grows on a little higher ground around the edge of bogs.

No. 3 grows in sandy places on high ground. Have any of them any nutritive value as foods for animals?

Yours truly,

HENRY A. SPRAGUE.

The specimens refered to above were submitted to the Botanist of the station for botanical determination and to the Chemist of the station for analysis, with the following results.

Botanist's Report.

No. 1. Sphagnum cymbifolium, Ehrb. Bog Moss.

No. 2. Polytrichum Juniperinum, Willd. Bear's Bed, or Robin's Rye.

No. 3. Hypnum splendens, Hedw.—H. proliferum, L.

No. 4. Hypnum Schreberi, Willd.

No. 5. Cladonia rangiferina. Reindeer Moss—a *lichen*.

Remarks.

Mr. Sprague's No. 3 was a mixture of two species, Nos. 3 and 4 above, which are reported in the analysis. No. 5, the Reindeer Moss, being a well known food of species of *Cervidæ*, was submitted to chemical examination for the sake of comparison.

The accounts given in works on botany, or elsewhere of *mosses* being used as food for man and the lower animals, generally if if not always refer to *lichens*, which should not be confounded with the *musci* or true mosses. We find no authentic record of *true mosses* being eaten voluntarily or having been fed to domestic animals. It is a fact of common observation that the domestic animals reject them. This may be due to their being unpalatable or possibly in some cases to deleterious properties. As animals will not eat them unprepared, they would have to be mixed, if fed, with something to make them palatable, as was done by Mr. Sprague. Whether they possess deleterious properties would have have to be determined by feeding experiments for each species. As the mosses have apparently never been examined chemically to determine their nutritive value, the results of the Station Chemist given below will be interesting. They indicate that the species examined contain much more nitrogen than the *lichen* (reindeer moss,) which is freely eaten by species of deer and that they compare favorably with timothy hay in amount of nitrogen, though it is less easily digested. A series of experiments to determine palatability, deleterious properties and digestibility would be interesting. A more exhaustive analysis might detect compounds that would materially affect the food value. The following is the

REPORT OF THE CHEMIST—MR. L. H. MERRILL.

Since the mosses are not likely to become very important food plants, it was not thought advisable to make a complete analysis of the specimens submitted, but to confine the work to a brief examination of the nitrogenous compounds which they contain. While we do not know the exact nature of these compounds as they exist in the species examined, yet it may be assumed that their value may be determined with some degree of accuracy by applying the same methods used in the study of fodders.

It is evident that the value of the mosses as food must depend upon their digestibility. They were accordingly submitted for twenty-four hours to the action of pepsin solution, prepared in the ordinary manner. The nitrogen was determined in the undigested residues, and the per cent. of the whole amount of the nitrogen digested calculated from these figures.

As a matter of interest a common lichen (Cladonia rangiferina) was added to the list. Two well-known fodders, Timothy Hay and Alsike Clover, have also been inserted in the table for more ready comparison.

Station number.	Names.	Mixture.	Total nitrogen.	Not digested by pepsin, %	% of total not digested.
CLIII....	Sphagnum cymbifolium, Ehrb......	8.30	.89	.60	33
CLIV....	Polytrichum juniperinum, Willd...	5.25	.90	.74	18
CLV.....	Hypnum splendens, Hedw.........	10.09	1.24	.79	36
CLVI....	H. schreberi, Willd.................	9.80	.94	.73	22
CLVII...	Cladonia rangiferina...............	6.59	.42	.23	45
XLIV....	Timothy Hay	....	1.20	.34	72
XLI......	Alsike Clover.................. ...	....	2.03	.55	73

It will be seen from these figures that one of the mosses contains as much nitrogen as the Timothy Hay; the others about three-fourths as much. The digestibility, however, in all of them is very low, in none of them reaching more than one-half that shown by Timothy. Nevertheless, if these figures be accepted as representing the actual food-value of the mosses and they prove palatable—which is doubtful—the facts obtained would seem to justify farther study.

Examination of Seed for Impurities.

The Station is prepared, so far as its facilities permit, to examine seeds for the presence of noxious weeds, and report upon them. Below is given the results of an examination to call attention to the nature of the work. Seeds of weeds present that can not be identified at sight, are grown and positively determined from the plant. Those intending to plant large areas of clover or grass could be assured of the absence or presence of noxious weeds and sometimes avoid the introduction of pests hard to eradicate when once established.

Report.

Weight of seed examined, one half ounce.
Name of seed, Red Clover, Trifolium pratense, L.

Total number of weed seeds,	121
Harmless—Herds Grass, Phleum pratense,	30
Harmful—Fox tail, Setaria glauca,	59
" Smart weed, Polygonum acre, " Black Bindweed, Polygonum convolvulus, L, " Polygonum ?	12
Rib Grass, Plantago lanceolata, L.	5
Unknown Weeds, two kinds,	15
Total,	121

Received from Mr. G. S. Flood, Waterville, Me., and purchased from F. J. Savage, Ft. Fairfield, Me.

Remarks.

It is impossible to get seed entirely free from foreign seeds. It is important, however, whether the few found are *harmless* like herds grass seed in clover, or whether they are the seeds of bad weeds. The above seed can not be regarded dirty, as the weight of foreign matter is very small, but it contains the seed of the *foxtail* and *English plantain*, one would not care to introduce in a meadow. For my own planting I would reject such a seed as the above.

ENTOMOLOGY.

Ticks.

Ixodes ricinus, L.

(Ord. Acarini: Fam. Ixodidæ).

We received specimens of a species of Tick from Mr. Thos. Lord of Skowhegan, found on the domestic cat. The American species of Ticks have not been studied much and the writings on the subject are meagre. Not being able to find a description of the species, some of the specimens were referred to the Dept. of Agric., Division of Entomology. They were examined by Dr. Marx, and Prof. Riley writes us that the form is *Ixodes ricinus*, L. The species sent us is very common in Maine and is the one which so badly infests our wild hare, or rabbit. We have seen rabbits during the month of July with the head almost covered with these ticks and in such a condition it must have been a misery to live.

Dr. Marx of the Dept. of Agric., we understand, is studying this group, and we may hope for a monograph of our American species.

Sphinx or Hawk Moths.

(Order Lepidoptera: Fam. Sphingidæ.

During the past season three species of sphinges have been received for examination, viz: *Smerinthus geminatus*, Say., *Triptogon modesta*, Harris, and *Sphinx gordius*, Cram.

As these moths are apt to attract attention on account of their size, a few words regarding them may be interesting.

They are called Sphinx moths, or Sphinges, because the *larvæ* have the curious habit of raising the anterior portion of the body and remaining motionless for a long time in that position, thus bearing a fancied resemblance to the fabled *Sphinx*.

HABITS.

The eggs are laid singly on the food plant, hatch in one or two weeks; the young larvæ are usually pale green or yellowish green and clothed with short, erect hairs. They molt or shed the skin about four times before they are fully grown. They have on the twelfth segment a spine that curves backward and is called the *caudal horn.* (This horn disappears after the first molt in a few species.) The mature larva is cylindrical and smooth or granulate. When done feeding they descend and usually enter the ground to transform, though a few make imperfect cocoons on the surface made of leaves drawn together with silk.

The moths are medium sized to large, the bodies short, fore wings comparatively long and narrow, hind wings much smaller, head large, clothed with hair-like scales, either tufted or appressed; eyes, large, hemispherical, naked. The proboscis usually long and slender and when not in use, coiled like a watch spring between the palpi. The wings usually move rapidly in flight. They are sometimes taken for humming birds. This is quite a large family, there being, according to Prof. J. B. Smith, over eighty species in temperate North America. According to Prof. Fernald there are nearly fifty species in New England, the most of which occur in Maine. Quite a number of the species feed upon the foliage of fruit trees, forest trees and shrubbery of economic importance. Of those mentioned above, *Smerinthus geminatus*, Say., is a general feeder and has been found upon the apple, plum, elm, ash and willow.

Triptogon modesta, Harris, feeds upon the poplar and cotton wood.

Sphinx gordius, Cramer, (Fernald Sphinges of New England, p. 44, Fig. 1, Pl. 1), has been called the Apple Sphinx on account of its common occurrence in orchards, but it feeds upon the ash, also upon the Sweet Gale (Myrica Gale, L. and the Wax Myrtle, Myrica Cerifera, L.) Those who are interested in the above species, or in the Sphinges generally will find the Sphinges of New England considered in detail in Fernald's Sphingidæ of New England, published in the Agr'l Rep't of Maine, 1886, or the Sphinges of America, north of Mexico, in Prof. J. B. Smith's Monograph, published by the American Entomological Society of Philadelphia, Pa.

CUT-WORMS.

The following letter regarding cut-worms was received at the Station. We place it and the answer on record as containing information perhaps important to others.

FARMINGTON, ME.. 6, 5, 1891.

DEAR SIR:

I send you by this mail specimens of a worm which is destroying a lawn in this place, in front of and around our county building. The soil is sandy and it has been top dressed for several seasons to get the lawn; and now the turf is about two inches thick. Rear of the building is a cemetery, been there for over a century.

Will you kindly look into this matter; tell us what the worm is, how to prevent further ravages by it, and what to do to kill out the thousands of worms now eating away at the grass roots.

I shall make an item about this lawn, also say I have sent specimens to the State College; and I hope you will write an article upon them to print in my paper. Nobody here, thus far has ever seen these worms here before.

Yours very truly,

JOHN M. S. HUNTER.

ANSWER TO MR. HUNTER'S LETTER.

ORONO, ME., July 24, '91.

Editor of Farmington Chronicle:

The specimens which you sent me some time ago for examination prove to be the Glassy Cut-worm known to entomologists as *Hadena devastatrix*, (Brace). There are a great many species of the so-called *Cut-worms*; some of them climb trees and eat the foliage, while others work about the roots or base of plants. They all do more or less damage and work at night. As a class they are hard to manage. When they are not numerous and affect gardens, digging them out of the hills where their depredations are noticed, or putting bunches of hay or small boards on the ground for them to hide under, and then examining and killing them, have proved good remedies.

When they affect field crops, meadows or lawns the treatment would have to be different and on a more extensive scale. If the lawn has been so far affected that the grass is dead and re-seeding will be necessary, the ground should be plowed next Spring and before the seed is sown a load of fresh cut grass thoroughly sprinkled with Paris green in water, 1 lb. to 150 gallons of water, should be spread upon the ground and left a few days. The worms will crowd to the surface for food, eat of the poisoned grass and die.

This same treatment has been successfully tried for cut-worms in corn fields or other crops planted in rows, the poisoned grass or clover being scattered in small bunches between the rows. If the lawn has not been destroyed so that re-seeding is necessary, and it is desired to treat it without disturbing the sod, then we would advise the use of Kerosene Emulsion. This has been successfully used for grubs in lawns at the Department of Agriculture, Washington, D. C.

You will find an account of the Experiments in Insect Life, Vol. 1, No. 2, page 48. (This journal is published by the Department of Agriculture and you can no doubt get a copy by addressing the Secretary of Agriculture.) You will find a formula for the preparation of Kerosene Emulsion in Dep't of Agriculture Report, 1884, page 331, and also some other information on the subject that will be instructive. Other articles on the treatment of cut-worms will be found in Insect Life, Vol. 3, No. 5, page 247; U. S. Agricultural Report 1885, page 270; Prof. Fletcher's Report, Central Expt. Farms, Ottawa, Canada, 1889; Canadian Entomologist 1889, Sept. or Oct., also in the writings of Prof. Cook and other entomologists to the Experiment Stations.

As the above cut-worm goes into the chrysalid state in July, its depredations are probably over for this season and it is more than probable, it apparently being confined to the lawn in question, that it will not give so much trouble next season. The chrysalids hatch into moths in the latter part of August or September and they will scatter to lay their eggs. Cut-worms are apt to be badly preyed upon by parasites and thus destroyed. Should they begin work again next Spring I would advise the grass trap or Kerosene Emulsion treatment. Should you need any more detailed information than I have given, write again.

Yours truly,

F. L. Harvey,

Entomologist for the Station.

REMARKS.

The above species, *Hadena devastatrix* (Brace), together with the Greasy Cut-worm, *Agrostis Ypsilon* (Rott.), were received from Mr. Sleeper, Auburn, Me., see letter pp. 200, 201, also reared by the writer from worms doing damage to corn and other crops about Orono. A species of Climbing Cut-worm, the Variegated Cut-worm, *Agrostis saucia* (Hubner), was sent by Mr. W. K. Burgess, Monroe, Me.

The above species are considered and figured below. The term *Cut-worm* is very loosely used, being often applied to the larva of the *June bug*, which cuts grass roots ; to the *wire worms*, the larvæ of the snapping beetles, and even to the *borers* that cut channels in woody plants. The term cut-worm is principally confined by entomologists to larvæ of the Owlet Moths *(Noctuidæ)*, that have the habit of hiding just under the surface of the ground during the day and feeding upon the roots, stem or leaves of plants by night. When the larvæ climb high and feed upon the foliage of tall plants or trees, they are called *Climbing Cut-worms*.

The cut-worms may be known by the following general characters :

The moths known as *Dart Moths* or *Owlet Moths* are deltoid or triangular in shape (see Figs. 4, 6 and 7) when the wings are closed, and usually fly at night, and often enter rooms, being attracted by the light. The worms when full grown measure from one to two inches in length, have sixteen legs (three pairs of true legs and five pairs of prolegs), thick bodies which taper somewhat at the ends ; without hairs and greasy looking, brown gray or greenish with indistinct longitudinal or oblique markings ; head long, shining red or brown, head and anal segments armed above with a horny plate, darker than the remainder of the body. On each segment are six or eight dark colored humps, each bearing a hair. (See Fig. 6.) When disturbed the worms curl themselves into a ring as shown in Fig. 2. There are between three and four hundred American species related to the cut-worms and many species besides the above are numbered among the pests of the farm, garden and orchard.

THE VARIEGATED CUT-WORM.

Agrostis saucia (Hubner).

(Ord. Lepidoptera: Fam. Noctuidæ.)

DESCRIPTION.

Eggs—round, flattened, pink, prettily ribbed and ornamented, laid in patches of several hundred on the twigs of the apple, cherry and peach. Mr. Monroe's specimens were found on the *trunks* of *plum* trees. Fig. 1, *a*, represents an egg enlarged, showing the ribbing and ornamentation. Fig. 1, *b*, represents a cluster of the eggs, natural size, attached to a twig.

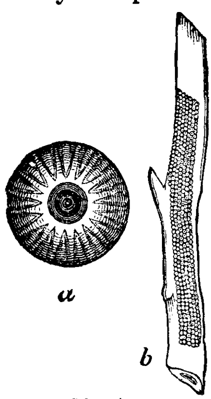


Fig. 1.

Larvæ, when young, dull yellow marked with darker spots. Full grown larva, dull flesh color, mottled with brown and black and elongated velvety black markings on the sides, large, when mature nearly two inches long. Fig. 2 shows the larva at rest and the head magnified to show the markings. The larvæ are mature in June, when they enter the ground form an oval cavity within which they change to the *chrysalis*, which is deep mahogany brown, pointed at the extremity, as shown in Fig. 3.


Fig. 2,

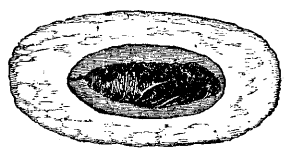


Fig. 3.

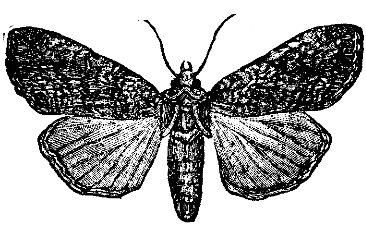


Fig. 4.

The *moth*, shown in Fig. 4, expands about one and three-quarters inches and the fore wings are grayish brown marked with brownish black; the hind wings are white and pearly, shaded toward the margin with pale brown. The moth is on the wing in July and lays its eggs as shown above.

THE GLASSY CUT-WORM.

Hadena devastatrix (Brace).

(Ord. Lepidoptera: Fam. Noctuidæ.

The eggs of this species and the egg-laying habit, so far as we know, are not known. Probably the eggs are laid on plants near the ground, which is the usual place of depositing them by cut-worms, and not in the ground, as formerly supposed. Brace, who originally described the moth, says the eggs are laid in autumn and hatch in May. The belief among entomologists now is that most cut-worms hatch in the fall and enter the ground, maturing the following spring.

Larva—length 1.8 inches, color translucent glassy green with a tinge of blue; head venetian-red, jaws black, a small black spot on each side, head shield distinct, hard, polished, dark brown; caudal plate not so well defined and pale. The larvæ is full grown the last of June and soon changes to the *chrysalis*, which is dark mahogany brown, attenuated at the end more than usual, two distinct slightly curved horns at the end with several stiff bristles around them. The larvæ is shown, Fig. 5, natural size; below the larva is one of the segments enlarged, showing the dots bearing hairs, usually found on cut-worms.

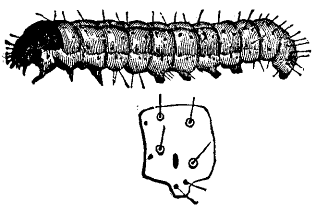


Fig. 5.

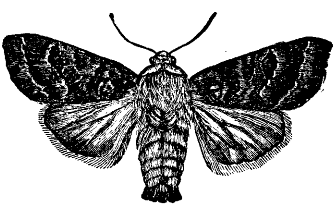


Fig. 6.

Moth—spread of wings from an inch and a half to an inch and three-fourths; fore wings grayish brown crossed with four more or less distinct white wavy lines, edged more or less with black; hind wings pale brownish gray. This species is on the wing in July. Those we transformed came out the third week in July. It is shown natural size in Fig. 6.

Feeding upon grass roots and corn in the hill, in Maine. Stalks of corn eight inches high were found cut by this species. Brace says it prefers beans, and several writers accuse it of cutting cabbage. It does not seem to be so abundant in Maine as the next species, though locally about Farmington, Auburn and Lewiston it did considerable damage the past season. This species is found in Canada and in the Southern and Middle States and we believe it has been found in Europe.

Greasy or Black Cut-worm.

Agrostis Ypsilon (Rott.)

(Ord. Lepidoptera: Fam. Noctuidæ.)

Eggs—pale fulvous; nearly spherical, base somewhat flattened; laid in small patches, often of two or three layers and sparsely covered with long scales from the abdomen of the female moth.

Larvæ when full grown about an inch and a half long, dull lead brown color with five longitudinal paler stripes; under side of body pale greenish yellow.

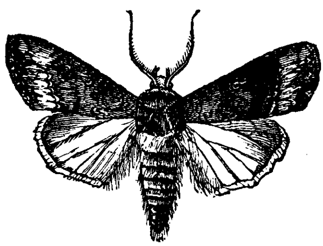


Fig. 7.

The *Moth*, Fig. 7, has dark fore wings with a bluish tinge on the front border and with a dark brown lance-shaped mark running from the posterior portion of a kidney-shaped spot in the middle of the wing. Hind wings pearly white and semi-transparent.

This species is world-wide in its occurrence and does great damage to garden and field crops. It has been found destroying cabbage, tomatoes, potatoes, tobacco, cotton, corn and beans. In confinement it will feed upon apple and grape leaves. There are two broods and the moths are on the wing from April to October. Those we reared emerged the last of August. It was found by Mr. Sleeper cutting corn, but more abundantly by him in potatoes. We bred the moths from worms taken in corn hills, but did not notice their work in potatoes near by.

Remedies.

The remedies may be divided into *natural* and *artificial*. Natural remedies are those provided by nature to hold insects in check and prevent their undue increase. Under this head would come *parasites*, like Ichneumons and Tachina flies, that lay their eggs in the worms and destroy them; *predaceous insects*, as various species of beetles, hemiptera, mites and spiders; *birds*, as the robin, catbird, blackbirds and poultry; and *quadrupeds*, as the skunk and probably moles, all of which eat them.

Artificial remedies are those devised by man to protect his crops, or destroy the insects feeding upon them. They may be divided into *preventive* and *destructive*.

Preventive are those that protect the plants from attack, but do not destroy the insects. *Destructive* are those that attempt to effectually remove the cause of the injury by aiming at the life of the insect.

PREVENTIVE REMEDIES.

a. Application of chemicals or other substances to the soil, which do not poison the worms but makes their food unpalatable. They do not seem to relish *salt* like the higher animals, and its use is highly recommended by Lintner and others. A handful is applied on the surface to each hill. Soaking the seed in *Copperas water*, one pound to the bushel of seed, allowing it to remain twelve hours, and then rolling it in plaster, would come under this head. This method is strongly recommended by Lintner. Tobacco has been used successfully to protect cabbage plants. It is put under the surface around the plants.

b. By protecting the plants so the worms cannot reach them. Under this head would come wrapping cabbage and other set plants with brown paper, burdock, walnut, or other leaves, or surrounding the base of the plants with tin or paper tubes or frames. Paper frames should be made broader at the top to prevent the worms crawling up the sides and set a little below the surface of the soil at the bottom. Tin tubes are much more durable. They can be made of slips of tin 2 in. by 10, bent in the form of a cylinder, and bent so as to loop at each end. They should be painted inside to prevent burning the plants by the sun. Bands can be made of tin and put around the base of fruit trees to protect them from climbing cut-worms.

Fitch recommended digging a shallow trench with perpendicular sides around the garden. This is based upon the belief that cut-worms travel to the cultivated ground from the adjoining meadows and pastures to feed upon the tender, cultivated plants.

c. By thick planting so as to have a good stand left after the worms have been fully fed. As Fitch expresses it, "plant one seed for the blackbird, two for the crow, three for the cut-worm and three to grow."

d. By dusting the foliage with dry powders like hellebore, ashes, or air slacked lime, to make it unpalatable to the worms.

DESTRUCTIVE REMEDIES.

a. Early plowing in the Fall. This destroys the weeds upon which the young worms feed and they starve. After summer crops are harvested the weeds are usually allowed to grow, giving the worms abundant food.

b. Late Fall plowing. This should be done after the worms have become torpid and have gone into winter quarters, so as to break the walls of the cells in which they hybernate, thus exposing them more fully to the changes of temperature.

c. Early Spring plowing and late seeding is supposed to cut off their food supply and starve them.

d. Late Spring plowing and seeding is supposed to give the worms a chance to mature on weed food and transform before the crop is planted.

e. Frequent cultivation of sod land is supposed to be beneficial. The moths lay their eggs upon plants near the ground. They deposit more eggs upon grass ground than elsewhere and the worms would accumulate in meadows. Turning every two years is advocated by some. Summer fallowing has been advocated in extreme cases.

f. Making deep holes about the hills with a dibble has been tried with good effect. For this purpose a sharpened stick about two inches in diameter is used. It can be thrust very rapidly deep in the soil once or twice near each hill. This makes a smooth, round hole into which the the worms fall and cannot get out, and they perish or eat each other. To make their death certain go over the field again the next day, thrusting the stick in the same holes to crush them.

g. Pouring solutions about the hills poisonous to the worms. Saltpetre has been used for this purpose and is said to destroy the worms and at the same time provide nitrogen food to the plants.

h. Dipping plants to be set in Hellebore Solution has been successfully used with tobacco plants. We have no record of its being tried for cabbage plants. One pound of Hellebore to ten gallons of water was used for tobacco plants.

i. Digging out the worms when the plants are seen to be affected by them. This is somewhat like locking the barn after the horse is stolen, but you have the satisfaction of destroying the perpetrator. Preventive remedies leave the worms to multiply over two hundred fold. Such a remedy as the above strikes a hard blow at the cause. This is a laborious method, but in connection with thick planting so a good stand will be left, it is effectual and largely practised.

j. Spraying the foliage with London purple, Paris green or Hellebore water will kill species that attack the foliage.

k. Shaking the trees or vines early in the morning and destroying the worms that fall has been recommended for climbing cut-worms.

l. Kerosene Emulsion has been successfully tried at the Dept. of Agric., Washington, D. C., for destroying root-eating grubs in grass grounds and would, without doubt, prove as effectual in killing cut-worms under similar circumstances.

For grass grounds we quote from Mr. Cogan's report to Prof. Riley (Insect Life, Vol. 1, No. 2, p. 49), the following: "The places affected were thoroughly drenched with an emulsion of kerosene in the proportion of one to sixteen, and the ground then well watered. I found that where this emulsion was used the grubs immediately ceased their depredations, penetrated further into the ground and not a live one was found to date after careful search, while in other places, where the emulsion was not used, they are still working in a lively manner." For the details of the experiment see periodical quoted above. The above method could be used to destroy the grubs of the May beetle as well as cut-worms.

We copy the formula for preparing kerosene emulsion from U. S. Dept. of Agric. Rept., 1884, p. 331, where further details may be found.

Kerosene, - - - - -	2 gallons,	67 per cent.
Common soap or whale-oil soap, -	1-2 "	37 " "
Water, - - - - - -	1 "	

Heat the solution of soap and add it boiling to the kerosene. Churn the mixture by means of a force pump and spraying nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens on cooling, and should adhere without oiliness to the surface of glass. Dilute the emulsion, before using, with nine parts of water. The quantities used above, when diluted, would make thirty gallons of wash. Prof. Riley urges the importance of proper emulsion, while Prof. Cook uses the following formula: Dissolve 1-4 lb. hard soap in two quarts boiling water, add 1 pint of kerosene and mix thoroughly. This should form a thick, cream-like mass. Before using, dilute with two gallons of water.

m. Killing the worms before the crop to be jeopardized is up, or the plants to be set are put out. There are several ways of accomplishing this end, known under the general names, ball trap system, and poison ball trap system. In all of these methods the land should be plowed early and the natural food of the worms destroyed. While they are starving, green food, as grass, clover, cabbage leaves, etc., may be put in bunches through the field. The worms collect to eat this food and crawl into the ground near by when done feeding or secrete themselves under the traps, and can readily be dug out or caught and killed. In the poison ball trap system the food is poisoned, thus saving the trouble of digging or searching for the worms.

Prof. Cook poisoned clover and then forked it from a wagon in small bundles, at intervals through the field. Prof. Riley recommends that the food will keep fresh longer if tied in balls or loose masses. Another party put poisoned cabbage and turnip leaves in rows fifteen to twenty feet apart through the field. The food can be poisoned with Paris green or London purple, preferably in suspension in water, though some have mixed it with plaster or flour.

THE COTTON-WOOD DAGGER.

Apetala lepusculina, (Gue.)

(Ord. Lepidoptera: Fam. Noctuidæ.)

The larva of the above species was received from Mr. W. F. Phinney, Standish, Me., and said to be feeding upon the leaves of the door-yard plantain. So far as we know, it has never before been reported as feeding upon species of *Plantago*. As the name indicates, it usually feeds upon the cottonwood, *Populus monilifera*.

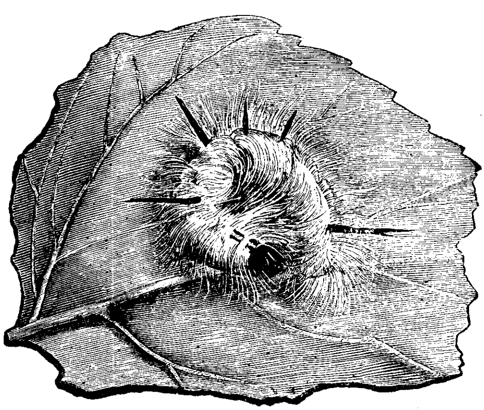


Fig. 8.

This species may be known by the following description:

Larvæ, when young, almost white with a distinct black dorsal line, short black tufts and sparsely covered with white hairs. When full grown, greenish yellow and thickly covered with long, soft, bright yellow hairs, which grow immediately from the surface and curl round the sides each way from the middle of the back; head black. There are two little black spots on the top of both the first and second segments, with a pale line between them. The top of segments 4, 6, 7, 8, 11, each bear a straight black brush of hairs. When at rest the larvæ remains curled upon the leaf as shown in Fig. 8. Our specimen agreed exactly with the above description in the number of black brushes, though some specimens have only three tufts, others six, and occasionally there are a few black hairs among the yellow on the body. Our specimens were received about August 1st, which would indicate the second brood, the first brood emerging in June. When grown the larvæ seek a sheltered place, chink in the bark of a tree or cap of fence, and change to a dark, shiny brown chrysalis, encased in a pale yellow cocoon composed of silk and hairs of the caterpillar. The insect passes the winter in the cocoon.

The *moth* has light gray fore wings with a broken black band near the margin and a few black spots in the middle. Hind wings white with black marks in the fringe.

THREE-TOOTHED APHONUS.

Aphonus tridentatus, Say.

(Ord. Coleoptera: Fam. Scarabidæ.)

Scarabæus tridentatus, Say, Jour. Acad. Nat. Sciences, Vol. 1, No. 2, June, 1817. Original description Say's Entomology, Vol. 11, p. 134. Proc. Acad. Nat. Sciences, 1856, pp. 21-23.

The technical description of the beetle as given by Say. is as follows:

Body black, punctured, clypeus, scabrous; an obsolete elevated abbreviated line in the middle; an elevated transverse tridentate line on the anterior submargin, confluent each side, with the lateral reflected edge; tip much narrowed, emarginate, reflected; thorax, punctures generally diffused; scutel impunctured; elytra with punctured striæ, beneath reddish brown. Length three-fifths of an inch. Described from a single specimen brought from Arkansas by Thos. Nuttall.

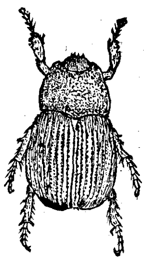


Fig. 9.

Popular Description of the beetle. Body black, thick set and about three-fifths of an inch long, head and thorax marked with small round pits. The head apparently ending in an upturned border bearing three teeth (the teeth are borne on the clypeus). The wing cases (elytra) each marked with about nine longitudinal pitted furrows, those on the edge obscure; legs stout, under side of body and legs reddish brown. The beetle is shown in Fig. 9, about one-fourth too large. The head is shown turned down so that the suture between the clypeus and epicranium does not show, and the teeth and the clypeus projecting forward appear in relief.

This species is distributed from Maine to Texas, but nothing is known of its habits or transformations. It has not before, so far as we can learn, been accused of doing injury to crops. The writer received specimens of this beetle the past season from Mr. Nathaniel H. Sleeper, Lewiston, Me., and from Mr. C. V. Manley, Auburn, Me. It was accused by both parties of cutting corn in the hill after the manner of the cut-worm. In the mouth of two witnesses the guilt would seem to be established.

Below we give the evidence found in the letters accompanying the specimens.

LEWISTON, ME., June 25, 1891.

To W. H. JORDAN, M. S. C:

Dear Sir:—I herewith send to you some samples of a corn destroyer that I found while hoeing my corn. What I want to know is whether the bugs I send are enemies or friends; whether the bug eats the corn, or whether he is after something that does. I found some ten or twelve of these bugs just by the stalks of corn and sometimes one or two inches under the surface, and sometimes there were two or three stalks eaten in one hill. In three instances I found the black cut or corn worm; once the worm and bug in the same hill, and one time a worm in the midst of the stalk eating his way up.

If you can put me in the way of saving the corn you will oblige me very much.

NATHANIEL H. SLEEPER.

When we received the above letter we were of the opinion that the cut-worms were entirely responsible and we wrote Mr. Sleeper to this effect and requested him to examine farther, and following is the response.

2ND LETTER.

LEWISTON, Me., July 1st, 1891.

F. L. HARVEY:

Dear Sir:—I received your letter last evening and thank you very much for it. I went out early this morning and dug into some hills of corn. In the first one found a beetle. Dug into a few more and found none, but found 24 hills of corn that had been dug into during the night. In some of them the roots had been all laid bare, and some only dug into at the side by some animal, I think a *skunk*. I suppose he was digging for beetles.

This evening I went out to the corn to look for worms and beetles. I dug into twenty hills; in nine of them I found the same beetle, in five were worms, in six were nothing found; in two of the five were worms in the stalk above the ground about 3 inches. The smallest one I send to you.

The large, dark colored one is he that eats off the stalk above ground and eats potato stalks and the beans more than he does the corn. The other two large ones were found where the stalk was eaten an inch below the surface, one in a place. These two are larger than others, and had the same appearance of those I found some days ago.

The largest black worm is seldom found in my corn; he is plenty in the potatoes. The two large, light colored ones I have found more plenty in the corn.

I send you a little box with some specimens.

Yours truly,

N. H. SLEEPER.

LISBON, ME., June 9th, 1892.

To F. L. HARVEY, ESQ.:

Dear Sir:—I received your letter a short time ago and was immediately called away, hence the delay, and will say that the ground was new land, was in grass for ten years, was never plowed before.

In the fall of 1890, I took out the stumps and stone—large pine stumps and lots of them. In many places the old forest mould was plenty. I think the beetle was a native of such places.

The manure was barnyard scrapings with Clark & Williams' superphosphate. I found no corn cut so low down where the cut-worm was. I found some cut-worms but not many; those that were cut (as I think) by the beetle were cut snug to the kernel or to the roots of the corn. You remember I wrote you the second letter; in that told you of twenty hills injured. If I remember, was six beetles found; some of them in close to the injured corn, though not quite certain of it. I feel certain he is the fellow that did it.

N. H. SLEEPER.

From the above evidence it seems certain that the beetles are in part responsible for the injury. This opinion is strengthened by the letters from another locality given below.

AUBURN, ME., June 27, 1891.

PROF. F. L. HARVEY:

Dear Sir:—I send you by this mail two beetles that we found eating the corn stocks, cutting them off just below the ground in the same manner as the cut-worm.

C. V. MANLEY.

AUBURN, ME., May 1892.

PROF. F. L. HARVEY,

Orono, Me.:

Dear Sir:—Your letter of the 23d received. The beetles that I sent you last season were found where barn manure was spread on the land and phosphate put in the hill. There were but very few cut-worms on the piece and not any in the hills where we found the beetles.

C. V. MANLEY.

As this beetle belongs to the same family as the May beetle and others that are found in the larval form in manure, probably it was introduced from that source. As its larvæ is not known nor any of its habits or transformations, nothing can be asserted regarding it. Efforts will be made to procure the larvæ and determine its changes. We know of no remedy better than killing the beetles when found.

PREDACEOUS WATER BEETLE.

Dytiscus verticalis, Say.

(Ord. Coleoptera: Fam. Dytiscidæ.)

The above species was unusually abundant the last season. Specimens were received from various places and several were found in the writer's yard in Orono, and several specimens caught by the cats, were taken from them. These insects are water-loving species and are attracted by moisture. Specimens sent by one party were found in the cellar among potatoes. The writer was much troubled by them in his cistern. The water got low and the cistern was filled from the river. The water was not strained and the larvæ probably introduced that way. In a few days the water began to smell and became very offensive. Several of the beetles were taken at various times from the valves of the pump. When water from streams is put in cisterns it should be filtered, and it would be well to keep cisterns closed during the time these beetles are on the wing.

The name *Dytiscus* means a diver and is given on account of the aquatic habits of the larvæ of these insects. The beetles may be known by their oval flattened form, brownish black color with a dull glaucous or sea green tint. The first and second pairs of legs are close together, the hind distant, set far back and used for swimming. The species in question is over an inch and a half long, black above with greenish reflections; thorax margined with yellow; elytra (wing covers) bordered with yellow excepting in front and near the hind margin bearing an oblique narrow yellow band.

The beetles, though larger, are related to the gyrating beetles often seen in large flocks playing on the surface of water and called lucky bugs by the boys. The larvæ are aquatic and are the terror of the ponds and streams, likened to sharks among higher animals.

The Parallel Elaphidion.

Elaphidion parallelum, Newm.

(Ord. Coleoptera: Fam. Cerambycidæ.)

This comparatively rare insect was received from Mr. Burgess of Monroe, in the larval form found boring into the twig of a plum tree. Though of rare occurrence it is interesting enough to figure so it may be recognized when seen.

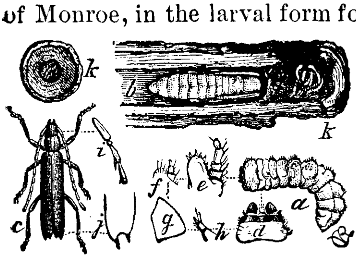


Fig. 10.

Fig. 10 *a* shows the larva, *b* a longitudinal section of the stem exposing the chrysalis in place, *k* a cross section of the chrysalis showing the boring, *d*, *e*, *f*, *g* and *h* head and mouth part of the larva, *i* the antenna of the beetle, *j* tip of the wing case. The beetle may be known by its dull brown color. It is a little over a half inch long. The eggs are laid in the axils of leaf buds. The young larvæ bore into the twigs enlarging the channels as they grow and when mature enter the chrysalis state in the stem and in due time emerge as beetles.

The Brown Ptinus.

Ptinus brunneus, Durfs.

Ord. Coleoptera: Fam. Ptinidæ.

The above named family embraces a number of minute species of beetles that do much injury, some boring into fruit trees, others into furniture, while others love animal food and injure hams, museum specimens, leather bound books and clothing.

The genus *Ptinus* may be known by having the head and thorax much narrower than the wings (elytra); the antennæ about as long as the body, filiform not enlarged or branched. The species *P. brunneus*, Durfs., is only one-eighth of an inch long, dark brown and convex above, thorax narrower behind, densely covered with minute hairs. It is interesting in connection with the correspondence given below. The insect enlarged is shown in Fig. 11, the real size being indicated by the hair line at the right.

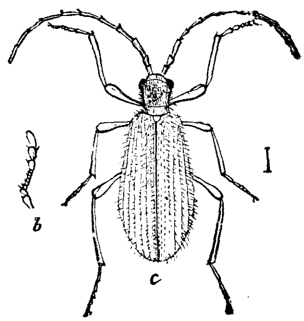


Fig. 11.

Calais, Maine, Jan. 8th, 1891.

To Professor Balentine, Orono:

Dear Sir:—To your address I send by to-day's mail a tin box of red pepper. It has been in our possession since March, 1888. The label, which I did not notice particularly, and unfortunately destroyed when I opened the box, was not removed until recently. The pepper is, as you see, infested with bugs. The box has been subject to all the extremes of our climate, and if the bug would feed upon our vegetation might become a troublesome pest. I hope that I have not foolishly intruded upon your time.

Respectfully,

Mrs. Esther Gardner,
Calais, Maine.

ORONO, ME., Feb. 1, 1891.

MRS. ESTHER GARDNER,
Calais, Me.

Dear Madam :—The box of infested red pepper which you sent to Prof. Balentine proved to be too tearful a subject for his consideration, and was turned over to me. I have wept, sneezed and delayed, but finally have summoned courage sufficient to examine the material and am now able to name the beetles you sent, which possess such strong stomachs and peculiar tastes. I have wondered while I have cried and sneezed, whether they have optic and olfactory nerves as sensitive as mine.

The beetles were probably not in the pepper when you bought it, as they are *Ptinus brunneus*, Durfs., a common, *indigenous* species known to feed upon wood, or sometimes on old books. I believe it has never been reported as feeding on red pepper. It must have found these conditions congenial as there were plump live larvæ of several ages with the beetles in the box. The above species is a brother to Ptinus fur, L., an imported European species that attacks museum specimens and sometimes clothing. The species mentioned with others belong to the Family *Ptinidæ*. Your conscience can be at ease. You have not turned loose in Maine an insect previously unknown to our fauna, for *Ptinus brunneus* is an *American*, besides, he does not aspire to growing vegetation for food but is content with dead vegetable and animal matter.

Yours very tearfully,

F. L. HARVEY.

THE GOLDSMITH BEETLE.

Cotalpa lanigera.

Ord. Coleoptera: Fam. Scarabæidæ.

This beautiful beetle, which is shown about natural size in Fig. 12, may be known by its broad oval shape; lemon yellow color above, head and thorax glistening like burnished gold; the under side of the body coffee-colored and thickly covered with whitish wool; legs brownish yellow or brassy and shaded with green. The larvæ of this insect is a large grub that feeds upon the roots of plants. It has been accused of injuring strawberries. It is shown natural size in Fig. 13. It requires three

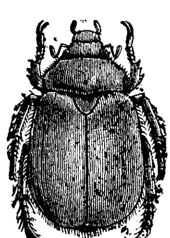


Fig. 12.

years to mature and resembles the grub of the May beetle.

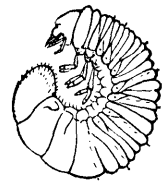


Fig. 13.

Having received several letters accompanied by specimens of this insect, we give below one received the past season, with the reply, for the benefit of others who may need similar information.

FRYE, Maine, June 26th, 1891.

STATE COLLEGE,

Orono, Maine:

I send a specimen of Beetle which I have never seen before in this State. Please examine it. It is sent in a tin box package.

Yours truly,

ALLEN REED,

Frye, Maine.

MR. ALLEN REED,

Frye, Maine:

Dear Sir:—The specimen you send is the Goldsmith-beetle, known to entomologists as *Cotalpa lanigera*, L., Family *Scarabœidæ*. This insect, in the perfect or beetle stage, feeds upon the leaves of trees, especially the pear, though other trees, as the elm, hickory, poplar and oak are subject to its attacks. During the middle of the day the beetles hide in the trees on the under side of the leaves, and are on the wing in the evening and morning twilight. The beetles come out of the ground in May and June. When abundant they do considerable damage to the foliage of trees, but they are so scaree in Maine we need not be concerned regarding them. This beautiful beetle always claims attention when found. We have specimens from the Kennebec valley and farther west in the State, but have never found or heard of a specimen being taken in the Penobscot valley or eastern part of the State. Will be pleased to answer any further questions you may ask regarding insects.

Yours truly,

F. L. HARVEY.

REMEDIES FOR BORERS.

Mr. Rutillus Alden called our attention to an orchard in Winthrop, Me., owned by Mr. Dexter Remick, that was coming into bearing and had been kept entirely free from borers by rubbing the trunk of the tree with the hand, while other orchards in the vicinity were infested. Regarding the matter of importance, we addressed some questions to Mr. Remick and condense the following facts from his reply: "My trees, Baldwins and Benonies, are five years old and just commencing to bear. They are planted on sandy loam and have been well fertilized with manure about the roots and are vigorous. My orchard is younger than my neighbors'. There are orchards within a short distance of mine. My trees have never been scraped but are naturally smooth and I have never applied any washes to protect them from borers.

I rub the trunks well with the hand twice every season, once in June and again in September. I rub as low as possible and to some height on the trunk." We tried to secure some larvæ of borers from the adjoining orchards, so as to learn which species of borer was common in the region, but did not. Under the circumstances we are not able to decide regarding the efficacy of the remedy. We see no reason why rubbing about the crown and lower part of the trunk would not destroy the eggs or newly hatched larvæ of the *Round-headed Borer*, (see Station Rept. 1888, p. 153.) The trunk would have to be free from crevices and the rubbing done at the right time, to prove effectual. We see no special efficacy in the hand and think a stiff brush would be better. If it is the *Flat-headed Borer* (see Station Rept., 1888, p. 155) that is working in the adjoining orchards and the above species rare, the vigor of the trees would protect them, as this borer usually prefers sickly trees, and as it lays its eggs on the *branches* as well as *anywhere* on the trunk, rubbing the base of the trunk would not protect the tree. We hope to get some of the larvæ this season.

We have noticed somewhere another remedy that seems to be simple and apparently practical for the *Round-headed Borer*, viz: to dig away the dirt an inch or two at the base of the tree, then tie around it a piece of thick paper, allowing it to extend a foot or more up the trunk; then put the dirt back. This arrangement prevents the beetle reaching the crown to lay its eggs. The paper should be left on the tree during the time the beetles are on the wing, that is from June to August. The paper could be poisoned with Paris green. Wrapping in this way is also advised to protect trees from rabbits.

BREEDING STATISTICS.

Dr. F. L. Russell.

The material for these statistics was obtained by sending out blank forms to farmers all over the state. The animals reported on were grades and full bloods of all the more common breeds of cows and also comprise a large proportion of "natives."

It is evident that the value of such statistics as these depends upon the number of animals upon which they are based, and the accuracy of the data. We make this brief report from the material at hand, hoping that it may awaken such an interest in the subject that a larger number than have heretofore done so will fill out and return to me the blanks that will be mailed them each year. This is a matter of general interest to farmers and stock breeders and we would urge upon them the importance of filling out the enclosed blanks as fully as possible. It is desired that the weight of the calves shall be taken within twenty-four hours of birth. Where conveniences are not at hand for doing this, that item may be omitted, as an estimated weight is not sufficiently accurate. We particularly desire that the last item on the blank should be carefully considered. We would decide the period of heat so as to include six or eight hours in the first part, the last six or eight hours in the last part, and the rest we would regard as the middle part of heat.

The reports that have already been received indicate that there may be some relation between the time of service and the sex of the calf. If this should prove to be true, it is a matter of considerable importance and we desire that great care be taken to correctly record the time of service.

The average period of gestation for 257 cows reported was three and one-half hours over forty weeks or 281.72 days. For the bull and heifer calves the average time was practically the same, for the bulls 281.74 days and for the heifers 281.69. The shortest period, 243 days, resulted in a heifer calf. The two longest periods were 303 and 304 days and the calves were both bulls. Of the 257 calves 135 were bulls and 122 heifers.

Of the 113 calves of which the weight at birth was given, the average weight is found to be 73.62 lbs. The average weight of

58 bull calves was 76.80 lbs., and of 55 heifer calves 70.11 lbs. The bull calves averaged 6.69 pounds the heavier. The heaviest and lightest calves were both heifer and weighed 122 and 40 pounds respectively.

Eighty-two cows were reported as having been served during the first part of their heat, and they produced thirty-one (37.8 per cent.) bulls and fifty-one heifers (62.2 per cent.)

Of seventy-six cows served during the last part of their heat, forty-two, or 55.26 per cent. produced bull calves and thirty-four (44.74 per cent.) produced heifers.

SUMMARY.

DURATION OF PERIOD OF GESTATION OF 257 COWS.

Maximum period	304.00 days.
Minimum "	243.00 "
Average when calf was a bull	281.74 "
Average when calf was a heifer	281.69 "
General average	281.72 "

WEIGHTS OF 113 CALVES AT BIRTH.

Maximum weight	122.00 lbs.
Minimum weight	40.00 "
Average weight of bull calves	76 80 "
Average weight of heifer calves	70.11 "
General average	73.62 "

RELATION OF THE TIME OF SERVICE OF 158 COWS TO THE SEX OF THE CALVES.

82 cows served during the first part of heat produced 31 bull calves and 51 heifer calves.

76 cows served during the last part of heat produced 42 bull calves and 34 heifer calves.

APPENDIX.

Hungarian Grass, CXXI.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
				Sheep 1.			
Fed daily	556.	504.4	51.5	61.4	170.5	254.	18.4
Excreted daily	216.8	184.5	32.3	24.4	58.9	92.9	8.3
Digested	339.2	319.9	19.2	37.0	111.6	161.1	10.1
Per cent. digested	61.0	63.4	37.2	60.2	65.4	63.5	54.9
				Sheep 2.			
Fed daily	556.	504.4	51.5	61.4	170.5	254.	18.4
Excreted daily	208.4	176.	32.4	24.9	56.5	84.9	9.6
Digested	247.6	328.4	19.1	36.5	114.0	169.1	8.8
Per cent. digested	62.5	65.1	37.0	59.4	66.8	66.7	47.8
				Sheep 3.			
Fed daily	556.	504.4	51.5	61.4	170.5	254.	18.4
Excreted daily	205.	175.3	29.6	22.3	54.8	89.2	9.1
Digested	351.0	329.1	21.9	39.1	115.7	164.8	9.3
Per cent. digested	63.1	65.2	42.5	63.6	67.2	64.8	50.5
				Sheep 4.			
Fed daily	556.	504.4	51.5	61.4	170.5	254.	18.4
Excreted daily	183.2	157.2	26.	20.6	48.1	80.3	8.0
Digested	372.8	347.2	25.5	40.8	122.4	173.7	10.4
Per cent. digested	67.0	68.8	49.5	66.4	71.7	68.4	56.

Hungarian Hay, CXXVIII.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
				Sheep 1.			
Fed daily	655.5	598.8	56.6	70.9	191.7	311.4	24.8
Excreted daily	228.9	199.4	29.5	28.4	60.7	101.3	8.9
Digested	426.6	399.4	27.1	42.5	131.0	210.1	15.9
Per cent. digested	65.8	66.8	47.9	59.9	68.5	67.4	63.9
				Sheep 3.			
Fed daily	655.5	598.8	56.6	70.9	191.7	311.4	24.8
Excreted daily	234.1	204.	30.1	28.3	63.5	103.1	9.
Digested	421.6	394.8	26.5	42.6	128.2	208.3	15.8
Per cent. digested	64.3	65.9	46.9	60.0	66.8	66.9	63.8

Southern Corn Fodder, CXXVII.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
	Sheep 2.						
Fed daily	504.7	461.5	43.1	55.5	154.7	236.4	14.8
Excreted daily	149.6	131.7	18.	18.8	38.7	70.0	4.1
Digested	355.1	329.8	25.1	36.7	116.0	166.4	10.7
Per cent. digested	70.3	71.4	58.2	66.1	74.9	70.4	72.3
	Sheep 4.						
Fed daily	504.7	461.5	43.1	55.5	154.7	236.4	14.8
Excreted daily	158.4	139.8	18.7	19.6	40.8	74.8	4.5
Digested	346.3	321.7	24.4	35.9	113.9	161.6	10.3
Per cent. digested	68.6	69.8	56.6	64.7	73.6	68.7	69.6

Field Corn Fodder, CXXV.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
	Sheep 1.						
Fed daily	403.2	372.5	30.7	45.2	102.5	211.4	13.3
Excreted daily	113.6	100.3	13.4	16.	24.3	56.2	3.8
Digested	289.6	272.2	17.3	29.2	78.2	155.2	9.5
Per cent. digested	71.8	73.7	56.3	64.6	76.3	73.4	71.4
	Sheep 3.						
Fed daily	403.2	372.5	30.7	45.2	102.5	211.4	13.3
Excreted daily	123.1	107.6	15.5	18.5	25.6	59.4	4.1
Digested	280.1	264.9	15.2	26.7	76.9	152.0	9.2
Per cent. digested	69.4	71.1	49.5	59.0	75.0	71.9	69.1

SWEET CORN FODDER, CXXVI.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Sheep 2.							
Fed daily	407.2	398.6	28.6	55.1	104.4	203.5	15.7
Excreted daily	124.7	106.7	18.	21.9	24.1	57.4	3.3
Digested	282.5	291.9	10.6	33.2	80.3	146.1	12.4
Per cent. digested	69.3	73.2	37.0	60.2	76.9	71.8	78.3
Sheep 4.							
Fed daily	407.2	398.6	28.6	55.1	104.4	203.5	15.7
Excreted daily	121.	104.4	16.6	20.1	24 4	55.8	4.0
Digested	286.2	294.2	12.0	35.0	80.0	147.7	11.7
Per cent. digested	70.2	73.9	41.9	63.5	76.6	72.5	74.5

TIMOTHY—MIXED CXL.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Sheep 1.							
Fed daily	646.6	614.3	32.3	48.1	211.0	324.3	30.8
Excreted daily	266.5	242.5	24.0	28.	97.2	109.7	7.4
Digested	380.1	371.8	8.3	20.1	113.8	214.6	23.4
Per cent. digested	58.7	60.5	25.7	41.9	53.9	66.1	75.9
Sheep 2.							
Fed daily	646.6	614.3	32.3	48.1	211.0	324.3	30.8
Excreted daily	283.5	261.3	22.3	26.9	106.4	118.9	8.9
Digested	363.1	353.0	10.0	21.2	104.6	205.4	21.9
Per cent. digested	56.1	57.4	30.9	44.0	49.6	63.3	71.1
Sheep 3.							
Fed daily	646.6	614.3	32.3	48.1	211.0	324.3	30.8
Excreted daily	243.	222.5	20.5	24.2	83.7	107.3	7.5
Digested	403.6	391.8	11.8	23.9	127.3	217.0	23.3
Per cent. digested	62.4	63.7	36.5	49.8	60.3	66.9	75.6
Sheep 4.							
Fed daily	646.6	614.3	32.3	48.1	211.0	324.3	30.8
Excreted daily	276.9	252.9	24.1	28 4	80.4	136.2	7.8
Digested	369.7	361.4	8.2	19.7	130.6	188.1	23.0
Per cent. digested	57.1	58.8	25.4	40.9	61.9	58.0	74.6

Timothy Hay, CXLI.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Sheep 1.							
Fed daily	646.6	610.	36.5	46.8	212.4	324.2	26.6
Excreted daily	274.8	251.3	23.5	25.6	99.5	118.9	7.3
Digested	371.8	358.7	13.0	21.2	112.9	205.3	19.3
Per cent. digested	57.5	58.8	35.6	45.3	53.1	63.3	72.5
Sheep 2.							
Fed daily	646.6	610.	36.5	46.8	212.4	324.2	26.7
Excreted daily	266.9	243.5	23.4	26.5	98.8	110.3	7.8
Digested	379.7	366.5	13.1	20.3	113.6	213.9	18.9
Per cent. digested	58.7	60.0	35.9	43.3	53.5	65.9	70.7
Sheep 3.							
Fed daily	646.6	610.	36.5	46.8	212.4	324.2	26.6
Excreted daily	267.7	246.5	21.2	23.5	96.7	117.8	8.2
Digested	378.9	363.5	15 3	23.3	115.7	206.4	18.4
Per cent. digested	58.6	59.6	41.9	49.8	54.5	63.7	69.2
Sheep 4.							
Fed daily	594.6	560.4	34.2	43.9	194.5	297.	24.9
Excreted daily	229.7	211.1	18.6	21.1	81.0	100.8	8.2
Digested	364.9	349.3	15.6	22.8	113.5	196.2	16.7
Per cent. digested	61.3	62.3	45.6	51.9	58.3	66.0	67.0

Sugar Beets, CXXXIII.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Sheep 1.							
Fed in hay, CXL, daily	461.8	438.8	23.	34.4	150.7	231.6	22.
Fed in beets daily	325.	302.8	22.2	31.2	17.4	251.4	2.8
Total fed	786.8	741.6	45.2	65.6	168.1	483.	24.8
Excreted daily	210.5	181.6	28.8	22.3	67.7	84.7	7.0
Total digested	576.3	560.0	16.4	43.3	100.4	398.3	17.8
Digested from hay	270.1	263.7	6.8	15.2	85.	147.3	16.3
Digested from beets	306.2	296.3	9.6	28.1	15.4	251.0	1.5
% digested from beets	94.2	97.6	43.2	90.0	88.5	99.8	53.5
Sheep 3.							
Total fed	786.8	741.6	45.2	65.6	168.1	483.	24.8
Excreted daily	208.7	174.9	33.8	21.5	63.3	82.7	7.2
Total digested	578.1	566.7	11.4	44.1	104.8	400.3	17.6
Digested from hay	270.1	263.7	6.8	15.2	85.	147.3	16.3
Digested from beets	308.	303.0	4.6	28.9	19.8	253.0	1.3
% digested from beets	94.8	99.9	20.7	92.6	11.3	10.0	46.4

MANGOLDS, CXXXII.

Sheep 2.

	Dry substance.	Organic matter.	Ash	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Fed in hay, CXL, daily	461.8	438.8	23.	34.4	150.7	231.6	22.0
Fed in beets daily	234.6	212.4	22.2	24.8	14.6	170.6	2.2
Total fed	696.4	651.2	45.2	59.2	165.3	402.2	24.2
Excreted daily	245.4	211.7	33.7	26.7	76.4	99.9	8.7
Total digested	451.0	439.5	11.5	32.5	88.9	302.3	15.5
Digested from hay	270.1	263.7	6.8	15.2	85.	147.3	16.3
Digested from beets	180.9	175.8	4.7	17.3	39.	155.0	......
% digested from beets	77.1	82.7	21.1	69.7	26.8	90.8	......
			Sheep 4.				
Total fed	696.4	651.2	45.2	59.2	165.3	402.2	24.2
Excreted daily	238.5	202.7	35.8	24.2	71.7	98.1	8.6
Total digested	457.9	448.5	9.4	35.0	93.6	304.1	15.6
Digested from hay	270.1	263.7	6.8	15.2	85.	147.3	16.3
Digested from beets	187.8	184.8	2.6	19.8	8.6	156.8	......
% digested from beets	80.	87.0	11.7	79.8	58.8	91.9	......

RUTABAGAS, CXXX.

Sheep 1.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Fed in hay, CXL, daily	461.8	438.8	23.	34.4	150.7	231.6	22.
Fed in turnips daily	219.	204.6	14.4	17.8	20.	156.	10.8
Total fed	680.8	643.4	37.4	52.2	170.7	387.6	32.8
Excreted daily	213.5	189.4	24.	21.7	68.2	92.9	6.6
Total digested	467.3	454.0	13.4	30.5	102.5	294.7	26.2
Digested from hay	270.1	263.7	6.8	15.2	85.	147.3	16.3
Digested from turnips	197.2	190.3	6.6	15.3	17.5	147.4	9.9
% digested from turnips	90.0	93.0	45.8	85.9	87.5	94.4	91.6
			Sheep 3.				
Total fed	680.8	643.4	37.4	52.2	170.7	387.6	32.8
Excreted daily	225.5	197.2	28.2	23.7	73.5	91.8	8.2
Total digested	455.3	446.2	9.2	28.5	97.2	295.8	24.6
Digested from hay	270.1	263.7	6.8	15.2	85.	147.3	16.3
Digested from turnips	185.2	182.5	2.4	13.3	12.2	148.5	8.3
% digested from turnips	84.5	89.2	16.7	74.7	61.	95.1	76.8

English Flat Turnips, CXXXI.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Sheep 2.							
Fed in hay, CXL, daily........	461.8	438.8	23.	34.4	150.7	231.6	22.
Fed in turnips daily...........	195.2	176.8	18.4	22.	20.4	126.4	8.
Total fed...................	657.0	615.6	41.4	56.4	171.1	358.0	30.
Excreted daily.................	209.8	187.	22.8	22.6	67.9	89.3	7.1
Total digested	447.2	428.6	18.6	33.8	103.2	268.7	22.9
Digested from hay............	270.1	263.7	6.8	15.2	85.	147.3	16.3
Digested from turnips	177.1	164.9	11.8	18.6	18.2	121.4	6.6
% digested from turnips	90.7	93.2	64.1	84.5	89.2	96.0	82.5
Sheep 4.							
Total fed......................	657.0	615.6	41.4	56.4	171.1	358.0	30.
Excreted daily.................	201.6	176.8	24.8	20.3	62.2	88.	6.3
Total digested.............	455.4	438.8	16.6	36.1	108.9	270.0	23.7
Digested from hay............	270.1	263.7	6.8	15.2	85.	147.3	16.3
Digested from turnips........	185.3	175.1	9.8	20.9	23.9	122.7	7.4
% digested from turnips	94.9	99.0	53.2	95.0	11.7	97.0	92.5

Gluten Meal, CXXXIV.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Sheep 2.							
Fed in hay, CXLI, daily.......	461.8	435.7	26.1	33.4	151.7	231.6	19.
Fed in gluten meal daily.......	269.4	266.4	3.	92.4	2.9	141.7	29.3
Total fed...................	731.2	702.1	29.1	125.8	154.6	373.3	48.3
Excreted daily................	230.2	209.7	20.5	26.6	74.5	98.5	10.
Total digested	501.0	492.4	8.6	99.2	80.1	274.8	38.3
Digested from hay	272.9	262.3	10.4	15.8	83.1	149.8	13.2
Digested from gluten meal	228.1	230.1	......	83.4	......	125.0	25.1
% digested from gluten meal..	84.7	86.3	......	90.2	......	88.2	85.6
Sheep 4.							
Fed in hay, CXLI, daily	413.5	389.6	23.8	30.8	135.2	206.3	17.4
Fed in gluten meal daily	269.4	266.4	3.	92.4	2.9	141.7	29.3
Total fed...................	682.9	656.0	26.8	123.2	138.1	348.0	46.7
Excreted daily................	195.4	176.5	18.9	32.0	54.3	82.	8.2
Total digested	487.5	479.5	7.9	91.2	83.8	266.	38.5
Digested from hay	244.4	234.5	9.4	14.5	74.1	133.5	12.1
Digested from gluten meal	243.1	245.0	......	76.7	9.7	132.5	26.4
% digested from gluten meal..	90.2	91.9	......	83.0	33.4	93.5	90.1

Wheat Bran, CXXXV.

Sheep 1.

	Dry substance.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Fed in hay, CXLI, daily	461.8	435.7	26.1	33.4	151.7	231.6	19.0
Fed in wheat bran daily	264.8	246.8	18.	46.5	29.	156.	15.3
Total fed	726.6	682.5	44.1	79.9	180.7	387.6	34.3
Excreted daily	280.7	250.9	29.9	25.6	84.	129.1	12.
Total digested	445.9	431.6	14.2	54.3	96.7	258.5	22.3
Digested from hay	272.9	262.3	10.4	15.8	83.1	149.8	13.2
Digested from wheat bran	173.0	169.3	3.8	38.5	13.6	108.7	9.1
% digested from wheat bran	65.3	68.5	21.1	82.7	46.9	69.6	59.5
Sheep 3.							
Total fed	726.6	682.5	44.1	79.9	180.7	387.6	34.3
Excreted daily	309.6	273.3	36.3	26.2	90.2	146.3	10.6
Total digested	417.0	409.2	7.8	53.7	90.5	241.3	23.7
Digested from hay	272.9	262.3	10.4	15.8	83.1	149.8	13.2
Digested from wheat bran	144.1	146.9	......	37.9	7.4	91.5	10.5
% digested from wheat bran	54.4	59.5	......	81.5	25.5	58.6	68.6

APPENDIX.

Annual Report of the State Pomological Society.

1891-92.

FARMINGTON, June 1, 1892.

HON. B. WALKER MCKEEN,

Secretary Maine Board of Agriculture:—

I have the honor to transmit herewith for publication in the annual report on the Agriculture of Maine, the transactions of the Maine State Pomological Society for the year 1891-92.

Yours respectfully,

D. H. KNOWLTON, *Secretary.*

MAINE STATE POMOLOGICAL SOCIETY.

Transactions for the Year 1891-92.

INTRODUCTORY.

The present volume will give to the general public some idea of the work of this Society, though its true measure of usefulness can hardly be measured by the printed page or the spoken word. In the affairs of the Society the officers have aimed at the great needs of the State, and while the means would not permit of doing all these needs called for, the work has been efficient and in many cases the results apparent.

So varied are the conditions in different parts of the State, that it is exceedingly difficult to make full recognition of them, but there has been an effort to give prominence to common truths in fruit culture. A careful study of all the conditions essential to fruit culture has convinced the officers of the Society that fruit culture in the State may be made a leading industry with profit to the grower. It is to be regretted that so few grasp the possibilities of fruit culture in the State. It may be due to the great conservatism of those engaged in rural pursuits, that better culture and improved methods are not more generally employed. By the use of these there are thousands of acres in Maine, that now barely pay more than the taxes that could be converted into a profitable fruit growing industry. Fruit culture as the leading business of the farmer is not a popular idea in Maine, and sometimes as one beholds the neglected orchards it is astonishing to note that, in many cases, even these for the labors expended prove to be the most profitable parts of the farm. To us the fact is suggestive of the grand results possible to those who devote themselves to fruit growing as a leading industry. With this in view it has been the aim of the Society to give special prominence to fruit growing as a business, which will yield sure returns for labor and capital.

The financial affairs of the Society are in good condition. It has been the effort of the officers to make a strict application of the life membership fees to the benefit of the permanent fund. So far as the Society has a debt it is represented by the deficiency in this fund. The founders of the Society intended to make this fund a source of revenue to the Society, and it is believed that the same fostering care in future will bring the fund up to the amount required under our by laws. There has been an effort to administer all the affairs of the Society with economy, and with this in view the expenditures have been kept within its income.

The executive committee have been called together only when absolutely necessary, and at the meetings of the committee the business of the Society has been given careful attention.

The institute work conducted under the Secretary of the Board of Agriculture has shown the wisdom of the Legislature in granting a larger appropriation for this purpose. Speakers representing our Society and the interests of fruit culture have been fully recognized in the programmes, and so far as the secretary is able to report they have faithfully served the interests intrusted to them. As this institute fund is to be used in the interest of agriculture it seems entirely proper that fruit growing should be given a place in the work commensurate with its importance.

A large number of fruit trees were set in 1891, but they were mostly in small lots upon farms where fruit growing is one of the sources from which the farmer has products to sell. There is also abundant evidence of wide-spread interest in fruit culture from all parts of the State, but there are very few who make it the leading industry of the farm. These fruit growers, by the way, are among the most successful farmers, and as they find that orcharding pays better than general farming are enlarging their business and aiming at the production of more and better fruit. This, we believe, is true that those who have produced the best fruit, and the most intelligently overcome the difficulties, have received the most profit from their labors. As the area of fruit production in the country increases year by year we must not expect very high prices, for not alone do we compete with apples grown from Maine to California, but there are oranges, bananas, grapes and other fruits that are selling so cheaply it is not strange that people buy them for dessert in place of the inferior apples displayed beside them. So that it may be better to protect the trees we now have, give them high culture, destroy the insects and fungi that injure the fruit, grow better fruit and sell it for higher prices.

The apple crop was hardly an average in quantity in 1891, but the quality was inferior in consequence of the coddling worm and other pests. Less than fifty per cent of the fruit was No. 1. So large was the crop in other parts of the country that a foreign market was sought. It is a source of regret that packers have been careless and in many instances the price has been low. Maine shippers generally, we think, have made money the past season though on the last shipments made in February and March, 1892, there were considerable losses. But the unfortunate thing about the whole matter is to be found in the fact that our Canadian neighbors, just over the line, have won a better reputation for apples than Maine. Our investigations lead us to conclude that the cause is chiefly in the inferior quality of the apples shipped from the State. By this we mean that it is unwise and in the end unprofitable to send to a distant market anything but the best fruits carefully packed. One of the largest buyers in Maine said to the writer, "There are only two farmers in this part of the State who know how to pack their fruit. If all would pack as well as they, Maine fruit would lead in the markets of Europe."

At the first meeting of the World's Fair Managers held in Augusta in May, 1891, three members of the executive committee were present, and by courtesy of the Board presented for their consideration the interests of Maine fruit growers in connection with the Fair. They urged the Board to make an appropriation of $2,000 for the purpose, and that the exhibition of Maine fruits should be entrusted to the Maine State Pomological Society. Again at a later meeting the executive committee was represented by President Pope, and by correspondence the committee have been in communication with the managers. The executive officers have urged at all times early action, and they believe that the organized fruit industries of the State are entitled to all they ask in their behalf. The officers of the Society have not deemed it advisable to appear at other meetings of the managers, as the funds are necessarily applied to other purposes. The latest information at this writing (April 1, 1892) is that the committee on fruits have unanimously recommended that $2,000 be set apart for the fruit exhibition and here the matter rests.

Should other action be necessary on the part of the Society, the executive committee will endeavor to secure what justly and honestly belongs to the fruit growing industry of the State.

Under date of December 16, 1891, the following letter was received from the World's Columbian Commission:

Mr. D. H. KNOWLTON, Farmington, Me.:

Dear Sir: As the available space for exhibits in the horticultural building, and the grounds assigned to the department of horticulture, is being rapidly taken, by intending exhibitors in this and foreign countries, let me urge upon you the necessity of immediately applying for the space needed for your State.

States that are tardy in making application will have only themselves to blame if they do not secure all the space to which the Board or the State Horticultural Society thinks they are entitled.

I would respectfully direct your attention to the following rule adopted by the Board of Reference and Control, and the Board of Directors of the World's Columbian Exposition, for the establishment and maintenance of separate state exhibits:

"All exhibits intended to be competitive and within the jurisdiction of juries or committees authorized to award prizes, must be located in some one of the general Exposition buildings, and be grouped according to the official classification, except such exhibits as can only be properly and advantageously displayed in the grounds; provided, however, that this exception shall only operate in those cases where, in the judgment of the director-general, he shall deem it expedient to grant the express permission."

Inclosed please find application blanks. Note well each rule. It is my earnest desire that your state make a grand horticultural display.

Very respectfully,

J. M. SAMUELS,

Chief, Dep't of Horticulture.

In response to this communication we could only say that our Society hoped the fruit interests of the State would be provided for under the Maine Board of Managers. That we had reason to expect that a good exhibition would be made under their direction.

Mr. Van Deman, Pomologist of the Agricultural Department, since his visit to Maine in 1890, has been earnest in his efforts to have Maine make a good exhibit of fruit at the World's Fair. As indicative of this interest we publish the letter following:

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF POMOLOGY,
WASHINGTON, D. C., Feb. 23, 1892.

MR. D. H. KNOWLTON, Secretary of State Pomological Society, Farmington, Maine.

Dear Sir: Many of the states are already active in their movements as to preparing for the great fruit show at the Columbian

Exposition and I trust that Maine is doing the same. Not having any definite information as to this, I write to find out the real status of the case. I remember having had two conversations with Governor Burleigh in regard to this matter more than a year ago and he seemed very anxious that the fruit exhibit should be in the hands of your Society and that it should be well supported financially. He asked me how much money it would take and I told him then that two thousand dollars would be a small figure, but that possibly you could make some kind of a show with that amount, but I think you ought to have twice that much.

Having had considerable experience in making large fruit shows and contending with other states than my own, I know something of the requirements and hope that those who have the control of the funds will be liberal with the fruit growers of Maine. You have a good State for growing many kinds of fruits and it would be a great advantage to have them shown up in good style so that all who see and hear of this show will be assured that Maine can produce something else than pine trees and icicles. If I can do anything to help on the good cause of Pomology in that corner of our country let me know.

Very truly,

H. E. Van Deman, *Pomologist.*

This communication with other matter upon the subject was forwarded to Hon. Henry Ingalls, chairman of the fruit committee of the World's Fair Board of Managers, with a request to submit to the board at the proper time.

During our winter meeting in Cornish, the following communication was received:

Mr. D. H. Knowlton, Secretary State Pomological Society, Cornish, Maine.

Dear Sir: I have your programme of the meeting this week and wish you would remember me to the members. No doubt you will have a good meeting.

One thing we greatly need at this office from your State, namely: About five good specimens of the standard varieties of the apple and pear from which to make models for the Columbian Exposition. Colonel Brackett of Iowa is now engaged in such work and we want to have your State represented in the collection and as yet we have almost nothing from there. Can you not make it a point at the meeting to pack a box with characteristic specimens and send them here by express at our cost for carriage? Next summer and fall we would like the same thing to be done with other varieties.

Very truly,

H. E. Van Deman, *Pomologist.*

In response to this call the executive committee sent specimens of the following varieties of apples: Tompkins King, Northern Spy, Mother, Ben Davis, Yellow Bellflower, Nodhead, Baldwin, Pound

Sweet, R. I. Greening, Starkey, Fall Pippin, Hubbardston Nonsuch, N. Y. Pippin, Munson Sweet, Baker Sweet, Bailey Sweet, Talman Sweet, Calif Sweet, Sweet Baldwin, Boardman, Fameuse, Roxbury Russet, Lord Russet, Twenty Ounce and several seedlings.

The following extracts from letters received from Mr. Van Deman show that the fruit reached its destination in safety.

"Your letter of the 19th February is just received and I trust the apples will arrive soon. We will try to make models which shall be characteristic, but if the specimens are badly bruised this will be hard to do, as the molds will take the slightest impression. Next fall I want to be sure to have good specimens from your State. I want Nodhead and all of the standard varieties so that Maine may not be left behind and especially in those varieties which succeed the best."

"They will be used in making models as we are now getting ready for the Columbian Exposition."

D. H. K.

OFFICERS FOR 1892.

President.

CHARLES S. POPE, Manchester.

Vice Presidents.

S. H. DAWES, Harrison.

D. P. TRUE, Leeds Centre.

Secretary.

D. H. KNOWLTON, Farmington.

Treasurer.

A. S. RICKER, Turner.

Executive Committee.

The President and Secretary, *ex officio;* H. W. Brown, Newburg; A. E. Andrews, Gardiner; J. W. True, New Gloucester.

Trustees.

Androscoggin	County,	I. T. Waterman, East Auburn.
Aroostook	"	J. W. Dudley, Castle Hill.
Cumberland	"	S. R. Sweetser, Cumberland Centre.
Franklin	"	M. C. Hobbs, West Farmington.
Hancock	"	F. H. Moses, Bucksport.
Kennebec	"	E. A. Lapham, Pittston.
Knox	"	Elmas Hoffses, Warren.
Lincoln	"	H. J. A. Simmons, Waldoboro'.
Oxford	"	C. H. George, Hebron.
Penobscot	"	C. A. Arnold, Arnold.
Piscataquis	"	H. L. Leland, East Sangerville.
Sagadahoc	"	A. P. Ring, Richmond.
Somerset	"	James S. Hoxie, North Fairfield.
Waldo	"	D. B. Johnson, Freedom.
Washington	"	L. S. Allen, Dennysville.
York	"	B. F. Pease, Cornish.

Member of Experiment Station Council.

D. H. Knowlton, Farmington.

Committee on Nomenclature.

Z. A. Zilbert, North Greene; D. P. True, Leeds Centre; C. M. Weston, Belgrade.

Committee on New Fruits.

D. H. Knowlton, Farmington; L. H. Blossom, Turner; J. W. True, New Gloucester.

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
*Atherton, H. N..............Hallowell
Atherton, Wm. P. ....Hallowell
Atkins, Charles G............Bucksport
Atwood, Fred ....Winterport
Averill, David C...............Temple
Bennoch, John E.................Orono
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........North Yarmouth
Chase, Martin V. B ....Augusta
*Clark, Eliphalet..............Portland
Cole, Horatio G ....Boston, Mass
Crafts, Moses.....................Auburn
*Crosby, William C..............Bangor
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
*Godfery, 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
Knowlton, D. H..............Farmington
Lapham, E. A.....................Pittston
Lombard, Thurston M............Auburn
Low, Elijah .... Bangor
*Low, S. S.........................Bangor
McLaughlin, Henry ....Bangor
Merrill, T. M...........West Gloucester
*Metcalf, M. J ....Monmouth
Moody, Charles H. ....Turner
Moore, William G.............Monmouth

* Deceased.

LIFE MEMBERS—CONCLUDED.

Moor, F. A.................. Waterville
Morton, J. A.................... Bethel
Morton, William E .... Portland.
*Noyes, Albert.................. Bangor
Perley, Chas. I.... Seward's (Vassalboro')
Pope, Chas. S.............. Manchester
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
Roak, George M .... Auburn
Robinson, Henry A............. Foxcroft
Rolfe, Samuel.................. Portland
Sawyer, Andrew S .... Cape Elizabeth
Sawyer, George B. .... Wiscasset
*Shaw, Stillman W........ West Auburn
Simmons, H J. A. .... Waldoboro'
*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
Tilton, William S........ Boston, Mass
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
Whitney, Edward K............ Harrison
Woodard, Mrs. S. M. .... Gardiner
Woodman, George W........... Portland

ANNUAL MEMBERS, 1891.

Allen, W. H.................. Augusta
Arnold, C. A.................... Arnold
Ballentine, Walter .... Orono
Bartlett, B. W.............. East Dixmont
Bartlett, M. E .... East Dixmont
Chandler, Lucy A.............. Freeport
Cook, Elijah .... Manchester
Coombs, Philip.................. Bangor
Crosby, Mary G................. Bangor
Dunning, Mrs. James .... Bangor
Dunton, John.................. Lewiston
Dudley, A. M................... Mapleton
Fairfield, F. S.............. Orono, Ont.
Fuller, H. W.................. Readfield
Grant, Mrs. Benson .... Lewiston
Grover, Mrs. F. D......... Bean's Corner
Hawkins, M. P.................. Auburn
Judkins, C. E .... Auburn
Knight, Lizzie M.............. Portland
Leech, H. T............ East Monmouth
Lemont, J. M .... West Bath
Manning, C. H.................. Lewiston
Merritt, E. W.................... Houlton
Merrow, J. H.......... South Smithfield
Munson, W. M. .... Orono
Nelson, O C........... Upper Gloucester
Nutting, James............ East Perham
Perkins, L. J.................. Portland
Ridley, B H.......................... Jay
Ring, A. P..................... Richmond
Swain, R E.................. West Leeds
Townsend, Mrs. B. T. .... Freeport
True, J. W............... New Gloucester
Waterman, Mrs Elbert...... East Auburn
Weston, C. M. .... Belgrade
Wharff, W. R.................. Gardiner
Wheeler, Charles E.......... Chesterville
Wheeler, Joseph B............... Corinth

* Deceased.

ANNUAL MEMBERS, 1892.

Abbott, L. F. .... Lewiston	Larrabee, P. P. .... North Sebago
Allen, W. H. .... Augusta	Munson, W. M. .... Orono
Brown, Henry W. .... Newburg	Plaisted, R. C. .... Gardiner
Cook, Elijah .... Manchester	Small, John C. .... Cornish
Harlow, F. L. .... Turner	

ANNUAL MEMBER, 1893.

Allen, W. H .... Augusta

Annual Statement of the Maine State Pomological Society for the Year Ending Dec. 31, 1891.

RECEIPTS.

Cash received State Treasurer, bounty for 1890	$500 00	
Agricultural Society	500 00	
Manufacturers' National Bank note	250 00	
life members	20 00	
annual members	40 00	
dividend Wiscasset Savings Bank	2 30	
Farmington Bank Stock	12 00	
Balance due Treasurer Dec. 31, 1891	3 57	
		$1,327 87

EXPENDITURES.

Cash paid Secretary's salary, 1891	$125 00	
clerk	9 90	
expenses	85 72	
premiums	562 00	
Knowlton, McLeary & Co , printing	20 47	
C. S. Pope	37 60	
A. E. Andrews	22 60	
A. E. Andrews	4 35	
J. W. True	20 00	
H. W. Brown	13 35	
A. S. Ricker	10 23	
Miss C. L Pope	5 00	
W. H. Allen	2 85	
Mrs. C. D. Waterman	1 00	
Hall & Knight	93	
R. C. Pingree & Co	1 30	
E. W. Wood	28 25	
C. F. Packard	12 75	
C. H. George	5 00	
F. R. Partridge	14 80	
Lewiston Journal	2 25	
Smith & Reid	7 87	
Wiscasset Savings Bank in favor of Permanent Fund	72 30	
Manufacturers' National Bank note	250 00	
discount & interest,	7 45	
overpaid by Treasurer, 1890	4 90	
		$1,327 87

Financial Condition of Society December 31, 1891.

ASSETS.

Due from State Treasurer, bounty for 1891	$500 00	
Property owned by the Society, estimated	150 00	
Permanent fund, Farmington National Bank stock	400 00	
Wiscasset Savings Bank	129 98	
		$1,179 98

LIABILITIES.

Due Manufacturers' National Bank	$250 00	
Treasurer (overpaid)	3 57	
		$253 57

Permanent Fund.

CREDIT.

By fees of 107 life members to December 31, 1891	$1,070 00	$1,070 00

DEBIT.

To Farmington National Bank stock	$400 00	
amount on deposit, Wiscasset Savings Bank	129 98	
balance due permanent fund	540 02	
		$1,070 00

A. S. RICKER, Treasurer.

TURNER, February 16, 1892.

This certifies that we have examined the accounts of A. S Ricker, Treasurer, for 1891, and find the same correct.

H. W. BROWN,
A. E. ANDREWS,
J. W. TRUE, } *Executive Committee.*

Cornish, February 17, 1892.

Maine State Pomological Society.

Report] of the Nineteenth Annual Exhibition Held in Lewiston, September 7, 8, 9, 10 and 11, 1891.

In accordance with recent custom the Society again joined with the Maine State Agricultural Society in holding a consolidated fair in Lewiston on the State Fair Grounds, September 7-11, 1891.

There have been larger displays of fruit, but the care of the exhibitors in selecting specimens for exhibition and arranging them upon the tables made the fair one of the most attractive to visitors.

The time was a little early to show fruit to the best advantage, but there was a profusion of flowers which were so arranged as to relieve the sameness of continuous fruit displays. The work of the committees was done promptly and with general satisfaction. So far as the officers know every one having aught to do with the pomological exhibition was well pleased.

Four counties—York, Washington, Piscataquis and Hancock—were not represented in the fruit exhibitions. Much regret was expressed in consequence, especially as the fruit shown from York county at our winter meeting was of excellent quality. We hope these counties may be represented at future exhibitions. The efforts of the Society to enforce its rules relative to the number of specimens of the different varieties meet with the approval of exhibitors.

It was a pleasure to have among our exhibitors, Mr. Elijah Low of Bangor, one of the oldest members of the Society. His exhibition of plums was one of the best ever shown at our exhibition. It is a pleasure to state that he also won honors in Massachusetts, receiving from the Massachusetts Horticultural Society a silver medal for best collection of plums. To those interested in plum culture we commend his paper on the subject published in last year's transactions.

The exhibition of flowers was very large, and the taste shown by exhibitors in arranging and caring for them deserves special mention. Of open-air flowers the display was especially large and fine.

The officers of the Society are under special obligation to Mr. E. W. Wood of West Newton, Mass., and W. H. Allen for valuable assistance in examining exhibits and awarding premiums.

The officers of the Society also desire to express their appreciation of the courteous relations existing between them and the trustees of the Maine State Agricultural Society.

List of Premiums Awarded at the Nineteenth Annual Exhibition, 1891.

APPLES—General Collections.

Best general exhibition of apples grown by the exhibitor in any part of the State: S. H. Dawes, Harrison, $15; J. S. Hoxie, North Fairfield, $10.

COUNTY EXHIBITIONS.

Best general exhibition of apples grown by the exhibitor in Androscoggin county: D. J. Briggs, South Turner, $8; John Dunton, Lewiston, $6.

For same in Aroostook county: James Nutting, Perham, $8; Allen M. Dudley, Mapleton, $6.

For same in Cumberland county: S. R. Sweetser, Cumberland Center, $8.

For same in Franklin county: B. H. Ridley, Jay, $8; E. F. Purington, West Farmington, $6.

For same in Kennebec county: E. A. Lapham, Pittston, $8; W. R. Wharff, Gardiner, $6.

For same in Knox county: Alonzo Butler, Union, $8.

For same in Oxford county: C. H. George, Hebron, $8; Lemuel Gurney, Hebron, $6.

For same in Penobscot county: E. H. Kenniston, Arnold, $8; C. A. Arnold, Arnold, $6.

For same in Sagadahoc county: A. P Ring, Richmond, $8; J. M. Lemont, West Bath, $6.

For same in Somerset county: J. H. Merrow, South Smithfield, $8.

For same in Waldo county: M. E. Bartlett, East Dixmont, $8; B. W. Bartlett, East Dixmont, $6.

For best collection crab apples: J. S. Hoxie, $1; E. H. Kenniston, Arnold, 50c.

SPECIAL PREMIUMS.

For best dish of Baldwins, Gravensteins, Northern Spy, Rhode Island Greenings, Roxbury Russets, Tompkins King, consisting of twelve specimens each.

Baldwins: G. K. Staples, Temple, $5; S. H. Dawes, $3.

Gravensteins: S. H. Dawes, $3; D. J. Briggs, $2.

Northern Spy: S. H. Dawes, $3; S. R. Sweetser, $2.

R. I. Greenings: E. H. Kenniston, $5; S. R. Sweetser, $1.50; Lemuel Gurney, $1.50.

Roxbury Russets: Lemuel Gurney, $3; H. T. Leech, East Monmouth, $2.

Tompkins King: S. H. Dawes, $3; C. I. Perley, Cross Hill, $2.

SINGLE VARIETIES.

Alexander: W. R. Wharff, $1; C. M. Weston, Belgrade, 50c.

American Golden Russet: C. I. Perley, $1; Hall & Wheeler, Chesterville, 50c.

Ben Davis: S. R. Sweetser, $1; C. I. Perley, 50c.

Deane: J. S. Hoxie, $1; A. C. Day, South Turner, 50c.

Duchess of Oldenburg: S. H. Dawes, $1; J. S. Hoxie, 50c.

Early Harvest: B. H. Ridley, $1; E. F. Purington, 50c.

Fallawater: C. I. Perley, $1; C. A. Arnold, 50c.

Fall Harvey: B. H. Ridley, $1; Hall & Wheeler, 50c.

Fameuse: S. H. Dawes, $1; B. H. Ridley, 50c.

Garden Royal: D. C. Averill, Temple, $1; C. I. Perley, 50c.

Hubbardston Nonsuch: S. H. Dawes, $1; T. M. Lombard, Auburn, 50c.

Jewett's Fine Red: S. H. Dawes, $1; A. R. King, No. Monmouth, 50c.

King Sweeting: C. I. Perley, $1; E. F. Purington, 50c.

Large Yellow Bough: S. H. Dawes, $1; Alonzo Butler, 50c.

McIntosh Red: S. R. Sweetser, $1; H. G. Fairbanks, North Monmouth, 50c.

Milding: C. I. Perley, $1.

Mother: W. R. Wharff, $1; S. R. Sweetser, 50c.

Munson Sweet: B. H. Ridley, $1; S. R. Sweetser, 50c.

Peck's Pleasant: J. S. Hoxie, $1; A. E. Andrews, Gardiner, 50c.

Pomme Royal: C. H. George, $1.
Porter: Hall & Wheeler, $1; S. H. Dawes, 50c.
Pound Sweet: S. H. Dawes, $1; C. I. Perley, 50c.
President: I. T. Waterman & Sons, East Auburn, $1.
Primate: S. H. Dawes, $1; E. F. Purington, 50c.
Pumpkin Sweet: E. F. Purington, $1; S. H. Dawes, 50c.
Red Astrachan: S. R. Sweetser, $1; A. P. Ring, 50c.
Red Canada: H. G. Fairbanks, $1; C. A. Arnold, 50c.
Rolfe: S. R. Sweetser, $1.
Russell: E. F. Purington, $1; D. C. Averill, 50c.
Somerset: H. G. Fairbanks, $1; S. R. Sweetser, 50c.
Starkey: C. I. Perley, $1.
Talman's Sweet: E. H. Kenniston, $1; Hall & Wheeler, 50c.
Tetofsky: J. S. Hoxie, $1; E. F. Purington, 50c.
Wagener: Hall & Wheeler, $1; S. H. Dawes, 50c.
Wealthy: T. M. Lombard, $1; S. R. Sweetser, 50c.
William's Favorite: S. H. Dawes, $1; C. I. Perley, 50c.
Winthrop Greeniug; A. P. Ring, $1; H. G. Fairbanks, 50c.
Yellow Bellflower: E. A. Lapham, $1; A. E. Andrews, 50c.
Yellow Transparent: E. F. Purington, $1.

PEARS—General Exhibitions.

S. H. Dawes, $10; L. J. Perkins, Portland, $8; C. M. Weston, $5.

SINGLE VARIETIES.

Clapp's Favorite: A. S. Ricker, Turner, $3; S. H. Dawes, $2.
Bartlett: S. H. Dawes, $3; A. S. Ricker, $2.
Belle Lucrative: Alonzo Butler, $1; C. I. Perley, 50c.
Beurre d'Anjou: H. T. Leech, $1; S. H. Dawes, 50c.
Beurre Superfin: D. P. True, Leeds Center, $1; S. H. Dawes, 50c.
Beurre Clarigeau: C. M. Weston, 50c.
Buffum: D. P. True, $1; C. I. Perley, 50c.
Doyenne Boussock: S. H. Dawes, $1; H. T. Leech, 50c.
Duchess d'Angouleme: S. H. Dawes, $1.
Eastern Belle: J. S. Hoxie, $1.
Fulton: L. J. Perkins, $1.
Glout Morceau: C. I. Perley, $1.

Goodale: S. H. Dawes, $1; C. M. Weston, 50c.
Howell: S. H. Dawes, $1; J. S. Hoxie, 50c.
Lawrence: S. H. Dawes, $1; John Dunton, 50c
Louise Bonne de Jersey: S. H. Dawes, $1; C. H. George, 50c.
Nickerson: C. M. Weston, $1.
Seckel: D. P. True, $1; S. H. Dawes, 50c.
Sheldon: S. H. Dawes. $1; C. M. Weston, 50c.
Souvenir du Congress: L. H. Blossom, Turner Center, $1.
Urbaniste: William Stuart, Lewiston, 50c.

GRAPES—General Exhibitions.

For best collection of air-grown grapes: S. H. Dawes, $3.

SINGLE VARIETIES.

Black Hamburg: C. H. Manning, Lewiston, $1.
Golden Hamburg: C. H. Manning, $1.
Sweet Water: C. H. Manning, $1.
Royal Hamburg: C. H. Manning, $1.

PLUMS—General Exhibition.

Elijah Low, Bangor, $6; S. H. Dawes, $4.

SINGLE VARIETIES.

Bavay's Green Gage: E. F. Purington, $1.
Bradshaw: E. F. Purington, $1; Elijah Low, 50c.
Green Gage: C. A. Arnold, $1; D. H. Knowlton, Farmington, 50c.
Prince's Imperial Gage: T. M. Lombard, $1; D. P. True, 50c.
General Hand: Lemuel Gurney, $1.
Guii: John Dunton, $1; E. F. Purington, 50c.
Jefferson: Elijah Low, $1.
Lawrence: Elijah Low, $1.
Lombard: Elijah Low, $1; C. H. George, 50c.
Magnum Bonum: Elijah Low, $1.
McLaughlin: Elijah Low, $1; Mrs. James Dunning, Bangor, 50c.
Moore's Arctic: Mrs. James Dunning, $1; Elijah Low, 50c.

Niagara: John Dunton, $1.
Penobscot: Elijah Low, $1.
Washington: Elijah Low, $1; E. F. Purington, 50c.
Yellow Egg: Lemuel Gurney, $1.

MISCELLANEOUS ARTICLES—Canned Fruit, Preserves, etc.

For most artistic display of fruits and flowers: Alonzo Butler, $4.

Best dish of peaches: S. H. Dawes, $2.

Abyssinian banana: R. E Swain, West Leeds, $2.

Collection canned fruits, etc.: Mrs. Benson Grant, Lewiston, $8; Mrs. Herman Corbett, Farmington, $5.

Collection apple jellies: Mrs. Benson Grant, $2; Mrs. F. D. Grover, Bean's Corner, $1.

Canned blackberries: Mrs. E. F. Purington, West Farmington, 50c.; Marcia Rose, North Greene, 25c.

Canned blueberries: D. C. Averill, 50c.; Miss Annie E. True, South Turner, 25c.

Canned cherries: Mrs. E. F. Purington, 50c.; Mrs. Elbert Waterman, East Auburn, 25c.

Canned gooseberries: Mrs. Herman Corbett, 50c; Mrs. Francis Hoyt, Winthrop, 25c.

Canned peaches: Mrs. J. B. Hunton, Auburn, 50c.; Mrs. Elbert Waterman, 25c.

Canned pears: Mrs. J. B. Hunton, 50c.; Mrs. C. E. Judkins, Auburn, 25c.

Canned plums: Mrs. Francis Hoyt, 50c.; Mrs. Elbert Waterman, 25c.

Canned quinces: Mrs. Benson Grant, 50c.; Mrs. Francis Hoyt, 25c.

Canned raspberries: Mrs. E. F. Purington, 50c.; Mrs. Elbert Waterman, 25c.

Canned strawberries: Marcia Rose, 50c.; Mrs. Francis Hoyt, 25c.

Canned tomatoes: Mrs. Francis Hoyt, 50c.; Mrs. Elbert Waterman, 25c.

Preserved apples: Marcia Rose, 50c.; D. C. Averill, 25c

Preserved currants: Miss E. B. Butler, Union, 50c.; Mrs. Herman Corbett, 25c.

Preserved cherries: Mrs. Herman Corbett, 50c.; Mrs. Francis Hoyt, 25c.;

Preserved pears: Mrs. D. S. Thomas, North Auburn, 50c.; Mrs. Herman Corbett, 25c.

Preserved plums: Mrs. Francis Hoyt, 50c.; Mrs. Elbert Waterman, 25c.

Preserved quinces: Mrs. Francis Hoyt, 50c.

Preserved raspberries: Mrs. Herman Corbett, 50c.; Mrs. Elbert Waterman, 25c.

Preserved strawberries: Miss E. B. Butler, 50c.; Mrs. Herman Corbett, 25c.

Assorted pickles: Mable E. Grover, Bean's Corner, 50c.; Mrs. Benson Grant, 25c.

Tomato catsup: Mrs. Francis Hoyt, 50c.; Mrs. C. E. Judkins, 25c.

Apple jelly: Miss E. B. Butler, 50c.; Mrs. D. S. Thomas, 25c.

Currant jelly: Mrs. Benson Grant, 50c.; Mrs. Elbert Waterman, 25c.

Grape jelly: Mrs. Francis Hoyt, 25c.

Quince jelly: Mrs. Francis Hoyt, 50c.; Mrs. Benson Grant, 25c.

Raspberry jelly: Mrs. F. D. Grover, 50c.; Mrs. Elbert Waterman, 25c.

Rhubarb jelly: Mrs. Benson Grant, 50c.; Mrs. Elbert Waterman, 25c.

Strawberry jelly: Mrs. Francis Hoyt, 50c.; Mrs. Elbert Waterman, 25c.

Maple syrup: C. H. George, 50c.; W. B. Fletcher & Son, Stark, 25c.

CUT FLOWERS.

Best display cut flowers: Charles S. Walker, Peru, $10; Mrs. Charles Stanley, Winthrop, $8; Mrs. B. T. Townsend, Freeport, $5; Mrs. A. B. Strattard, Monroe, $3.

Exhibition of roses: W. E. Morton & Co. of Portland, $5; John Burr, Freeport, $3.

Dahlias: Mrs. Chas. Stanley, $2; Mrs. B. T. Townsend, $1.

Chinese pinks: Charles S. Walker, $1; Mrs. B. T. Townsend, 50c.

Carnations: Mrs. Lucy A. Chandler, Freeport, $2; W. E. Morton & Co., $1.

Lilies: Charles S. Walker, $2; Mrs. Charles Stanley, $1.

Asters: Charles S. Walker, $1; Mrs. Lucy A. Chandler, 50c.

Pansies: Mrs. H. W. Fuller, Readfield, $1; Charles S. Walker, 50c.

Zinnias: Mrs. Charles Stanley, $1; Mrs. Francis Hoyt, 50c.

Phlox Drummondii: Mrs. Elbert Waterman, $1; Mrs. Charles Stanley, 50c.

Balsams: Mrs. Elbert Waterman, $1; E. C. Pope, Manchester, 50c.

Petunias: Mrs. Elbert Waterman, $1; Mrs. D. H. Knowlton, Farmington, 50c.

Gladioli: Charles S. Walker, $2; Mrs. Lucy A. Chandler, $1.

Verbenas: Mrs. H. W. Fuller, $2; Mrs. Francis Hoyt, $1.

Calendulas: Mrs. Charles Stanley, 50c.

Nasturtiums: E. C. Pope, $1; Mrs. Elbert Waterman, 50c.

Vase of cut flowers (amateur): Mrs. D. H. Knowlton, $3; Mrs. H. W. Fuller, $2; Mrs. Francis Hoyt, $1.

Best twelve button-hole bouquets: John Burr, $2.

Floral design (professional): John Burr, $8.

Floral design (amateur): Miss Lizzie Knight, 617 Congress St., Portland, $5; Mrs. Lizzie M. Walker, Peru, $3.

Floral wreath: W. E. Morton & Co., $2; Lucy B. Burr, Freeport, $1.

Floral dinner table decoration: Mrs. H. W. Fuller, $2; W. E. Morton & Co., $1.

Dish of cut flowers: W. E. Morton & Co., $2.

Basket of cut flowers: W. E. Morton & Co., $2; Mrs. D. H. Knowlton, $1.

Artistic exhibition of dried grasses: Mrs. Charles Stanley, $2.

Artistic exhibition of everlasting flowers: Mrs. Charles Stanley, $1; Mrs. H. W. Fuller, 50c.

GREENHOUSE AND POT PLANTS.

Exhibition greenhouse plants: John Burr, $15; Charles S. Walker, $10.

Pot plants: Mrs. Lucy A. Chandler, $10; Mrs. Anthony Cummings, Auburn, $8.

Ferns: John Burr, $3.

Geraniums: John Burr, $2.

Begonias: John Burr, \$2.

Coleus: Charles S. Walker, \$2; John Burr, \$1.

Dracæna: John Burr, 50c.

Double Geranium: John Burr, 50c.

Single Geranium: John Burr, 50c.

Salvia Splendens: John Burr, 50c.

Foliage Begonia: John Burr, 50c.

Flowering Begonia: John Burr, 50c.; Mrs. Charles Stanley, 25c.

Coleus: Charles S. Walker, 50c.; John Burr, 25c.

Fuchsia: John Burr, 50c.

Carnation: John Burr, 50c.

Single pot plant: Charles S. Walker, \$1; Mrs. Lucy A. Chandler, 50c.

Wardian Case: Charles S. Walker, \$1.

SPECIAL PREMIUMS.

Floral design arranged by boy or girl under fifteen: Lucy B. Burr, \$3; Iola Agnes Walker, Peru, \$2.

Cut wild flowers: Mrs. C. E. Waterman, East Auburn, \$3.

Pressed wild flowers: John G. West, Lewiston, \$1.

Summary.

Apples	\$254 00
Pears	56 50
Grapes	7 00
Plums	30 00
Canned fruits, etc	45 00
Flowers	169 50
	\$562 00

Business Transactions.

MEETINGS OF EXECUTIVE COMMITTEE.

March 12, 1891. The committee met at Leeds Junction for the revision of the premium list for 1891.

It was voted to accept an invitation of the trustees of the Maine State Agricultural Society to hold the next annual exhibition of the Society in connection with the exhibition of that society in Lewiston, September 7-11, 1891.

In reply to the above the Secretary received the following letter from the secretary of that society under date of May 16, 1891:

MR. D. H. KNOWLTON,

Secretary, Maine State Pomological Society, Farmington.

MY DEAR SIR:—It gives me pleasure to report that, at the meeting of the trustees of the State Agricultural Society, held in Lewiston, Monday, May 11th, it was unanimously voted to extend an invitation to the State Pomological Society to hold a joint exhibiton on the Fair Grounds, Lewiston, September 7-11, inclusive, upon the same conditions as in 1890.

Very respectfully,

G. M. TWITCHELL, *Secretary*.

May 27th, Messrs. Pope, Andrews and the Secretary appeared before the Board of Managers of the World's Fair held in Augusta, and presented to the Board the interests of Maine fruit growing, and urged upon the committee the importance of giving the industry a conspicuous place in our Maine exhibition.

October 28th, the committee met at Augusta in the rooms of Secretary of the Board of Agriculture. The accounts of the Society were audited and the treasurer was authorized and directed to make a temporary loan not exceeding three hundred and fifty dollars to meet the current bills of the Society.

The treasurer was also instructed to pay the premiums awarded at the last exhibition to the amount of $562.00, as per schedule furnished by the Secretary.

Plans for the winter meeting were discussed and the details were referred to the president and secretary.

Later, on invitation of Mr. B. F. Pease, member of the Board of Agriculture for York county, representing the Ossipee Valley Agricultural Society and citizens, arrrangements were perfected for holding the meeting in Cornish.

PUBLIC MEETINGS.

September 11, 1891. Annual meeting of the Society, held in Park Hall, Lewiston, at 6.30, P. M. Officers for 1892 were elected. See p. 9.

After the election of officers, the Society was addressed by Mr. E. W. Wood, chairman of the fruit committee of the Massachusetts Horticultural Society.

Prof. Munson and others were present at the meeting and joined in the discussions following the address.

February 17 and 18, 1892. During the winter meeting held in Cornish the following business was transacted:

Report of treasurer was presented and accepted. See p. 13.

The secretary read a letter from G. M. Twitchell, secretary of the Maine State Agricultural Society, inviting our Society to hold a joint exhibition with them in Lewiston, September 6-9, 1892, on the same terms as in 1891. It was voted to accept the invitation and to refer the details of the exhibition to the executive committee.

Prof. W. M. Munson, Prof. Elijah Cook and A. S. Ricker were appointed a committee to examine the fruit on exhibition and reported as follows:

REPORT OF FRUIT COMMITTEE.

The exhibit of fruit while not large, is in the main of a good character. Some of the standard varieties, however, are poorly represented. Only two plates of Northern Spys do that variety full justice. The display of Bellflowers deserve special mention. The quality being above the average.

The largest collection exhibited was that of S. H. Dawes of Harrison. This exhibit while very creditable in itself was injured by frost and was not placed in competition with the other smaller collections.

Aside from the collection named, your committee would name as first in point of excellence the collection of C. E Jones of Sweden; second, that of William Warren of Cornish, and third, that of W. R. Wharf of Gardiner. Creditable collections were also exhibited by D. P. True, Leeds Center; Charles S. Pope, Manchester; W. R. Sturdivant.

SINGLE PLATES.

BELLFLOWER—A. E. Andrews of Gardiner, exhibited some specially fine fruits.

BALDWINS—Exhibited by J. W. True of New Gloucester, and C. E. Wheeler of Chesterville. Those shown by Mr. True were of special merit.

BEN DAVIS—J. W. True, New Gloucester.

POUND SWEET—J. W. True.

WEALTHY—James Nutting, Perham, Aroostook county. The specimens are well selected and of interest as showing the variety on which the growers of northern Aroostook depend for winter fruit.

BOTTLE GREENING—John Hanscom, Biddeford.

BIDDEFORD, Me., February 18, 1892.

Dear Sir: I sent you day before yesterday a small box of "Bottle Greening" apples, thinking the variety is not so well known in Maine as its merits entitle it to. The trees are hardy and thrifty; good bearers—a *full* crop one year and a smaller one the next. The apple stands well in our markets, where they are now quite well known. The bark of the Bottle Greening tree is of as light color as a common willow tree.

I hoped to have been able to have attended the Cornish meeting, but other engagements prevent.

Yours truly,

JOHN HANSCOM,

Former Editor and Proprietor of "The Maine Sentinel."

Three baskets of Baldwins said to be of the original type, exhibited by R. G. Smith of Cornish, are deserving of mention; as are also the specimens of *Vicar* pears shown by D. P. True of Leeds Centre.

An interesting feature of the exhibit is the collection of forced vegetables from the forcing house of the State College. This collection consists of three varieties of tomatoes, two varieties of radishes, one variety of carrot, three varieties of cucumbers, one variety of snap beans. A specimen of Pepino or "Melon Shrub" from the same source is of interest.

E. COOK.

A. S. RICKER.

W. W. MUNSON.

A. E. Andrews, W. A. Luce and D. H Knowlton were appointed a committee on resolutions, and reported as follows:

Resolved, That the thanks of the Maine State Pomological Society are hereby tendered to the Ossipee Valley Agricultural Society for their kind reception and thoughtful attention shown during this meeting.

Resolved, That our thanks be extended to the citizens of Cornish and vicinity for their cordial reception.

Resolved, Further, that our thanks be extended to the Maine Central and Saco River Railroad for the courtesy shown to us of reduced rates over their lines to attend this meeting.

Resolved, That our thanks be extended to the press for their notices of the meeting and to their representatives for their excellent reports.

Resolved, That our thanks are especially due to the Cornish Glee Club for their most excellent music, adding so much to the enjoyment of the occasion.

A. E. ANDREWS.

WILLIS A. LUCE.

D. H. KNOWLTON.

After discussing the subject the following resolution was passed: That a committee of three be appointed to consider the advisability of petitioning the next legislature for an increased appropriation for the Society, the committee to report at the annual meeting.

The following committee was chosen; D. H. Knowlton, Chas. E. Wheeler, Willis A. Luce.

The President read a letter from Gen. Chas. P. Mattocks, to the effect that he expected to be with us and present an outline of work for the Columbian Exposition.

The matter of making an exhibition at the World's Columbian Exposition was referred to the executive committee.

A communication from the division of Pomology was read as follows:

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF POMOLOGY,
WASHINGTON, D. C., November 1, 1891

To the Horticultural Societies of the United States:

As the means of securing concerted and mutually beneficial action between the Department and persons interested in Pomology and kindred subjects throughout the country, it is suggested—

1st. That, through the State Horticultural Society or similar organization, provision be made in each State and Territory for supplying to the Department for the Division of Pomology a complete and annually corrected list of officers and members of State and local organizations of fruit-growers, with their post-office addresses and the specialties in which they are interested.

2nd. That the Secretary of each State Society send to the Department for the Division, as soon as determined, the name of the place and the date of each meeting, and, as soon as issued, the programme for the meeting.

3rd. That each Society, State and local, supply the names and addresses of members of a standing committee, consisting of reliable and experienced fruit-growers, to respond to the circulars of inquiry which may from time to time be sent out for the Division.

The Department, as far as practicable—

Makes free distribution of bulletins and other publications of the Division of Pomology as well as those of other and kindred Divisions, upon the basis of lists of members furnished.

Invites the sending of specimens of new varieties for estimates of probable value; of unrecognized varieties for identification; and of known varieties from localities in which they are specially successful, for examination and description. On application, mailing boxes and franks will be sent for such purposes.

Distributes, at certain times, a limited supply of seeds, scions, or plants of imported or little-known fruits; and these are placed for testing in localities where they are likely to receive proper care and suitable conditions of climate and soil.

The proposed co-operation will be greatly aided if the regular meetings of the societies of adjacent states are so timed that they do not occur on the same dates. This will make possible in some cases the attendance of a representative of the Department at a series of State meetings, and it is suggested that the executive boards of State societies consider this when arranging for the dates of their annual meetings.

Very respectfully,

EDWIN WILLITS,
Assistant Secretary.

U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF POMOLOGY,
SOUTH HAVEN, MICH., November 21, 1891.

PRESIDENT CHAS. S. POPE:

Dear Sir: Believing that the suggestions of the enclosed circular offer inducements of much value to societies in the way of increased inducements to membership, I request that you cause the matter to be laid before your Society when in session, and I be informed of the action taken and of the further wishes of the Society in the case.

Very truly yours,
T. T. LYON,
Agent in special charge.

In conformity to the foregoing request a committee was appointed as follows: Willis A. Luce, South Union; James Nutting, East Perham, and Willard H Waterman, East Auburn.

PAPERS, DISCUSSIONS, REPORTS, ETC.,

PRESENTED AT THE

UNION WINTER MEETING

OF THE

Maine State Pomological Society and the State Board of Agriculture,

HELD IN

SMITH & WARREN'S HALL, CORNISH,

February 17th and 18th, 1892.

Mine host — it was an apple-tree —
He smilingly received me,
And spread his choicest, sweetest fruit
To strengthen and relieve me.
And when I rose and would have paid
My host so open-hearted,
He only shook his lofty head —
I blessed him and departed.

— *From the German.*

The Union Winter Meeting.

INTRODUCTORY.

In order to extend the influence of the Maine State Pomological Society in the western part of the State the officers of the Society were unanimously in favor of holding the 1892 winter meeting in York county. In due time there came a cordial invitation from Mr. B. F. Pease, member of the Board of Agriculture, in behalf of the Ossipee Valley Agricultural Society and citizens to hold the winter meeting in Cornish. Under these circumstances it was a pleasure to accept the invitation, and largely to the cordial co-operation of citizens the Society is indebted for one of its most successful meetings.

Secretary McKeen of the Board of Agriculture took an active personal interest in shaping the programme and conducting the meeting. The relations existing between the Society and the Board are very cordial. A union of forces adds strength and enables both organizations to do the most efficient work. It is hoped these pleasant relations may continue in the future.

Under these favorable auspices the winter meeting was held in Smith & Warren's Hall, Cornish, Wednesday and Thursday, February 17th and 18th, 1892. The following programme was announced in due time:

PROGRAMME.

Wednesday, A. M.

Opening Exercises. Reports of Officers.

Address of Welcome, George F. Clifford, Esq., Cornish.

Response, B. Walker McKeen, Secretary State Board of Agriculture.

President's Annual Address, Charles S. Pope, Manchester.

AFTERNOON.

Our Labors and Our Rewards in Fruit Culture,
J. W. True, New Gloucester.

Fruit Exhibitions,
D. H. Knowlton, Secretary Maine State Pomological Society

EVENING.

Our Chosen Family, Willis A. Luce, South Union.
Pear Culture, S. H. Dawes, Harrison.

Thursday, A. M.

Experiments in Spraying,
W. M. Munson, Professor of Horticulture, State College

AFTERNOON.

Grape Culture, Henry W. Brown, Concord, Mass.
Selling Our Fruit,
Chas. E. Wheeler, Ex-Member of the Board of Agriculture, Chesterville.

EVENING.

Fruit Growing in Maine Compared with other Agricultural Industries,
L. F. Abbott, Agricultural Editor, Lewiston Journal.
How Shall We Keep the Boys on the Farm?
Prcf. Elijah Cook, Manchester.

The papers and addresses were followed by discussions which were joined in by a large number of fruit growers from various parts of the State. The papers and discussions bore directly on practical fruit topics and were listened to with interest.

The exhibition of fruits though not as large as at some former meetings was of excellent quality. This is especially true with reference to Yellow Bellflowers, Tompkins King, Baldwins and one or two other varieties. It was a pleasure to note the fine fruit shown by the fruit growers in and about Cornish. Several varieties were especially deserving of notice.

The officers of the Society desire to express their gratitude to the officers of the Ossipee Valley Agricultural Society and the citizens of Cornish, for their hearty co-operation in carrying on the meetings. Interest in the meetings increased until the last and all seemed well-pleased with the results. The *Portland Press* and *Eastern Argus* were represented by special reporters and gave extended reports of each session. Other papers in the State were represented and gave excellent reports of the meetings.

It should be borne in mind by the reader that the papers and discussions following are the ideas of individual fruit growers, and do not necessarily bear the approval of the Society. They are, however, the results of large experience in fruit growing and deserving of careful consideration.

OPENING EXERCISES.

At the appointed hour February 17, 1892, in Smith & Warren's Hall, in Cornish, George F. Clifford, Esq., in behalf of the Ossipee Valley Agricultural Society and the citizens of Cornish and vicinity gave the following

ADDRESS OF WELCOME.

In simple, honest words, such words as come unbidden to the lips when out of the fullness of the heart the mouth speaketh, and in that word of all word else, that in such similitude pervades so wide a range of distant differing tongues, in arctic chill and tropic heat, on Greenland's icy mountains and India's coral strand, alike the type and essence of a hearty greeting to a stranger guest, in behalf of the people of this vicinity I bid you welcome among us.

I believe that one of the great privileges attaching the human race is intercommunity; the reciprocal interchange of ideas and belief. Man is a social being and to be a man he must be social. He who is otherwise in taste and tendency is a perversion.

Solitude breeds selfishness. Selfishness breeds envy. Envy is the parent of hate and at the feet of hate there sprout a multitude of vices and of crimes. The purpose and the method of a man like this are warped to suit the bent of his depraved mentality. Honor and manhood sink beneath a swelling tide of wrong, to cover which hypocrisy outspread her tattered mantle and when that convict garb is once assumed, the devil has foreclosed his mortgage and redemption has expired. How opposite the picture of the life of him who carried out the purpose of his being and mingles as a man among his fellows.

An honest, manly pride becomes the mainspring of his being. Before his eyes in constant panorama pass the work, the graces and accomplishments of his associates. Their example is his inspiration, and to be like them is the goal of his ambition. At the feet of wisdom, from the scholar's lips and in the teachings of experience he learns the way and travels it to its grand end. Somehow, somewhere in that life journey, by the operation of a law not made with hands, something is done, some particle is added to the great mosaic of our social life without which it would be unfinished, incomplete as far as wrought.

I mean that when a man perverts his nature to its baser possibilities society suffers an injury; and when a man gives to his faculties their true direction and development the race is benefited, and I say that in social intellectual intercourse there does exist and can be found a great promoting power of mankind's dearest interests.

The field is broad and marvelous in its diversity of surface and capacity. By far the greater portion of its vast expanse is yet unbroken by the plow. But each new year brings in new ground, and every year brings new conceptions of the truth that head and hand can work together everywhere and that each occupation has as much its field of thought and study as of manual toil. There comes new meaning to the dictum that man shall eat his bread in the sweat of his brow. This great truth you, my friends, who are to-day our honored guests, have come to demonstrate to us and in behalf of our people and their agricultural and pomological interests and in behalf of social intellectual development and progress everywhere, I thank you for your presence and bid you God-speed in your noble work.

RESPONSE BY HON. B. WALKER McKEEN.

It seems hardly fitting that I should be called upon to utter a word at a meeting devoted to the interests of fruit growing. Being a novice in the business I can only say a few words, by way of responding to the eloquent words of welcome, with which the honorable gentleman has greeted us. It is always pleasant to receive such words of welcome and encouragement, coming, as they do, with such evidences of hearty sympathy for our work.

The study of pomology is fraught with many difficulties, but is, I believe, very enchanting to all those who have a genuine love for the trees, shrubs and flowers with which God has beautified and adorned our hill-sides and valleys. The science has a marked and prominent place in our country's history, as well as in the history of the world. Particularly the apple takes its place as an exponent of all that is beautiful and desirable. From the time when it tempted our first parents, until to-day, it has been a constant source of help and encouragement to all mankind, and I trust that I may be pardoned if I say that, in my judgment, it is destined to play a still greater part in our history, from this time on, until it shall become a most potent factor in bringing us back to Eden.

When the Israelites sent out their spies to explore the promised land they brought back a single cluster of grapes, so large that it was carried on a pole between two men. I have often studied this picture when a boy and wondered at the fertility of the soil which was capable of producing such beautiful specimens of this most luscious fruit. The value of our farms must be rated, not by their acreage, but by the amount of their available fertility. And as we grow more proficient in the art of growing fruit, it has become a symbol of our fertile soil and our national prosperity; just as the grapes of Eschol were considered by those weary, foot-sore but courageous and clear-headed men of old, to be the best evidence of the fertility of the promised land.

Mr. President, I believe there is one point which we, as a people, overlook. It is a point worthy of our careful consideration. As we study out the mysteries of our art and become more and more proficient in it we must of necessity become better men and better women, capable of higher and nobler achievements. Thus the scale of humanity becomes raised and a long stride is taken in the advancement of civilization.

The American Pomological Society was formed in 1850, and has had much to do with the rapid advancement in the knowledge of the best methods of cultivating fruits. Its history is replete with items of great moment and it has had for active workers in its ranks some of the best men this country has produced. Who does not know and honor such men as Wilder, Hancock, Barry, Thomas, Warder, Elliott, Prince, Manning, Field, Campbell and Strong? In fact, these men and the cause for which they labored, have so far interwoven themselves into our history as to become a part of our national existence.

There are many reasons why the study of pomology should be encouraged in our State. Here are found the soil and climate which are adapted to growing, to perfection, nearly every variety of fruit, both large and small.

Many acres of unoccupied land are only waiting for the hand of the tree planter, to bloom into a second Eden, from which no serpent will lure us, and to which all eyes will turn with pride. Gentlemen, the Society comes before you with some of the best representative pomologists in our State, and will endeavor to present lectures which shall contain valuable instruction; but remember that none of the speakers profess to be infallible. They come as learners, as well as teachers, and if, at any time, any of you wish to ask questions or make suggestions I trust you will feel at perfect liberty to do so. Please remember that this is your meeting, and that it is my wish as well as the wishes of the representatives of the Pomological Society that it be conducted as you desire. The only favor we ask, is that you carefully consider all the points which may be brought up, and, if any of them commend themselves to you, as worthy, that you put them into practice. Your duty to this meeting continues after it is closed. If you will do it fully, you must endeavor to carry to your homes the facts as presented, and put them into your every day practice. Weave them into your life work, and thus become a factor in promoting the higher and more noble development of your town, your county, and your State.

Mr. President, again thanking you, and through you the citizens of Cornish and vicinity for this most cordial welcome, I will say that we are ready for the business of the day.

Mr. Charles S. Pope, President of the Society, being introduced, gave his

ANNUAL ADDRESS.

Ladies and Gentlemen, Members of the Pomological Society:

As I greet you again on this our nineteenth anniversary, it is natural to take a retrospective view, to learn what we have accomplished, and note the advancement that has been made in every branch of horticulture. There has been a wonderful increase in our orchard products since the organization of this Society, with new markets opened, which now take our surplus, with as good prices as in former years.

The prevailing low prices of the present season have discouraged many apple growers and led them to believe that the business is overdone and that an apple orchard is now poor property. But let us compare this with the other farm crops. In favorable seasons the price obtained for many of these, is below the cost of production. But even this, however, is not wholly lost. Our fruit in such seasons reaches many who are unable to pay the higher prices. Our surplus can be shipped with a profit to more distant markets, and this may accrue to our advantage in future years.

The most marked progress has been in the growing of small fruits. Twenty years ago a garden of small fruits was rarely seen outside the villages, where now are found acres of berries for which we have a good market at remunerative prices. The strawberry in particular is found to be a very profitable crop when rightly managed, as our people consume large quantities of this berry, and now depend largely upon other states for a supply. Therefore, so long as the demand is larger than the supply, we have the advantage of being able to furnish fresh berries directly to the consumer, and consequently at better prices than are realized by those in the older fruit growing sections, where there is more competition.

The growing of plums which had been nearly abandoned, has been started again with good prospect of success. We are now able to control the "black knot" and destroy the curculio, and judging from the fruit displayed at our exhibition the past two years, our people will soon supply themselves and the markets with an abundance.

It is now expected that this Society will be called upon to take charge of collecting and forwarding the fruit for exhibition to the Columbian Exposition in 1893. This will give the people of Maine a grand opportunity to show the world that the State of Maine, if unable to raise the largest fruit, can excel in coloring and quality, and can raise some of the winter apples for shipping, to better advantage than any other state in the Union.

If our fruit growers are alive to their interests and are willing to give us their assistance, we shall be able to make an exhibition which will be of great advantage to the State and perhaps open new markets for our fruits. We must at least show, and this we can do, that we can produce the best shipping fruits of the country. It will require more labor and time, than any of our officers are able to give, and we must have the co-operation of all the best fruit growers of the State.

Our greatest effort in former years, has been to induce the farmers to set more trees and vines. Our aim now should be, to urge them to take better care of those already set if they would get the best returns for their investment. With the great increase of insects and the injury from fungi and other diseases we predict that the common farmer will grow less apples in the coming years and the business will pass more into the hands of specialists, who have more time and taste to contend with these pests. No doubt in future years, the spraying apparatus will be considered as necessary in fighting these enemies of the orchard, as the planter and harrow in the cornfield.

In most of our old orchards the natural fertility of the soil is somewhat exhausted. Diseases have multiplied and insects have increased wonderfully. The situation has changed, and he who would reap much of a harvest must be able to meet all these new conditions. More attention must be given to fertilizing the orchard, and with the aid of the scientist, we shall be able to combat both insects and diseases.

What is the lesson for fruit growers in the bountiful crop and low prices of the past year? We find many discouraged ones who will neglect the orchard and fruit garden, until a year of better prices, to find then the trees and vines weak and dying for want of proper care. With seasons of such low prices the people will learn to consume more fruit, and thus it will become a necessity to such, and will help to keep up the price in future years. The cost of raising and marketing fruit must be reduced to a minimum. First by better care and fertilizing, to raise more and better fruit; by the use of arsenical poisons to destroy the insects and some fungicide to hold diseases in check and more care in the selection of varieties which will find a ready market.

In many cases the thinning of apples will pay a large profit, as a tree overloaded will bear fruit too small for market, and also injure the tree, both by exhausting its vitality and breaking its branches.

Thinning fruit has been practiced for many years in our pear orchards, and we think will give the best of results to those who wish to raise choice apples that will bring fancy prices.

After reading the reports of the sales of Maine apples in Liverpool this season I am most thoroughly convinced that some plan should be devised to keep up the reputation of our apples abroad. I am aware that Maine fruit was, on the whole, very poor this year. The fall was quite warm and the winter fruit matured rapidly and was not as firm as usual, so that after remaining a week or more on the warm steamer, much of it arrived in very poor condition and the shipper realized little, if anything, for his apples. I saw many apples packed this winter and do not wonder that a large part of the sales were reported "slack" and "wet."

Is it good policy for the orchardists to sell his apples to the shippers and have everything sent abroad to glut the market? One-half the apples packed for No. 2 on many farms the past winter were only fit for the stock or to be ground for cider. Many of these were sold for less than the cost of the barrel, added to the freight charges and other expenses, and this cheap fruit thrown upon the market injures the sale of the better grades. I think we should take more pains to urge upon the fruit growers the necessity of packing his No. 1 apples only, and have them strictly No. 1 and make some other disposition of his poorer fruit. With the facilities we have in this State for fruit growing we can surely compete with any other section, and we should with our ability to raise high colored, high flavored, firm apples, have a reputation second to none in the world. I believe this ruinous policy of grasping for the whole, in our methods of packing is very short-sighted, and will work great injury to the business in future years.

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

The President's Annual Address was submitted for examination to a committee consisting of Z. A. Gilbert, W. M. Munson and H. W. Brown, who later in the meeting submitted the following:

The committee to whom was submitted the President's annual address for examination and report, having attended to that duty, submit the following report:

In a general way we commend the address to the attention of the fruit growers of the State as well worthy of their confidence.

The suggestion that less attention be given to the further planting out of trees, and instead that we encourage the expenditure of more effort in the care and culture of the trees we now have in hand. We want fruit, and there are but few orchards to be found in the State which are receiving so much of fertilization and of careful and constant attention as its profitable production will pay for. We join with the President in the conclusion that the profits of business call for more of attention to the trees we have rather than more trees planted out.

In regard to protecting our Maine fruits from the damaging effects of association in the market with the inferior fruits with which they go to market. We believe the influence of this Society should be exerted to keep the inferior fruit commonly designated as No. 2, out of the market in their present form. We fully believe if the No. 2 fruit of New England of the last crop could have been out of the market that the good fruit remaining would have realized more money than both qualities have brought as they have been marketed. This inferior fruit can be put into forms of usefulness and of value, and where it will not drag down the price and choke the demand for the better fruit. We recognize the fact that buyers have a responsibility in this matter and it is only in conjunction with them that any change in this direction can be accomplished.

In the matter of packing we recognize the importance of the subject yet see no way to control or improve present practices so long as the packing is controlled by, and only subject to, the approval of the buyer. Growers seem to do their duty when they conform to the requirements of the buyer. It is more than we should undertake to require to ask or urge that sellers make the quality of the fruit put up better than is asked for. We do not therefore charge off the defective packing wholly to the account of the producer.

Z. A. GILBERT,
W. M. MUNSON, } *Committee.*
H. W. BROWN,

OUR LABORS AND OUR REWARDS IN FRUIT CULTURE.

By J. W. TRUE, New Gloucester.

While looking over our account of fruit sold the past season, the question presented itself whether our reward was a fair compensation for our labor in raising and preparing it for market, and many were the thoughts that were called up. In the first place our reward for labor should not always be counted in dollars and cents. Those people that have accomplished the most for their fellowmen have not taken their pay in the "Coin of the Realm" but in a more lasting and satisfactory way. The inventor is never satisfied with his invention, no matter how much money it brings him but pushes on making improvements here and there, and the reward in which he takes the most satisfaction is that he has accomplished something new that will give him a name and fame that will live after he has passed away. The *Navigator* will push out for the cold *North* with just the hope that he may be able to discover new lands or get just a little nearer to the *North Pole* than any of his predecessors, if he succeeds it is ample reward for him; he counts money as nothing compared to his victory over the forces of nature with which he has been contending. The fruit grower should have something of that spirit. The forces of nature give us the small natural fruit, in many cases entirely worthless for family use, and many of the noted varieties can be greatly improved by care and culture.

The first to be done in all cases is to decide that you will make fruit growing profitable and then study up on that subject so that you will thoroughly understand the needs and requirements of the particular branch that you have decided to engage in; if it is the apple, the soil should be well understood, and the kind best adapted to that purpose selected and then fit it thoroughly as for some crop; then when your tree starts you will take pride in it every time your eye beholds it; you feel that your labor is being rewarded with a thrifty tree before there is any indication of fruit to be sold. If possible have all rows straight, especially if in a place that you visit often; if not too expensive I wou'd at least clear all obstructions from the points or places that the trees should occupy in order to make the rows perfectly straight. In our own case we have made every line straight, in some cases requiring the stone tools with powder and quite an amount of team labor to accomplish it. After the stone was out the place would be filled in with soil, and then put in the tree, and now after a number of years we can pick out those trees and admire them as they occupy the space once taken up by a stone. In one case the boulder seemed almost too large and requiring too great an expense to remove, and so the tree was planted about two feet out of line and just as close to the rock as it could be set; it grew well for three or four years; it was in a row that anyone could see from the farm road, and every time apparently that we passed that way we saw it, or if we took our friends that way they would remark "there is one tree out of line," then an explanation would follow. It happened to be a Baldwin tree from a Western nursery, and one spring it failed to put forth its leaves and upon examination was found to be winter-killed, root and branch; then at an expense of about three dollars that stone was removed and a new tree set out, and a portion of the interest is paid on that outlay regularly every time we pass that way.

The trees should be procured from some reliable nursery or perhaps seedlings and then top graft, for if a particular variety is bought, that particular variety is expected to grow. We had a little experience in that line the very first purchase that we ever made—a half dozen pear trees were bought of a tree peddler one of them was to be a President. The tree was well cared for and it grew finely; in a year or two a single pear appeared; it was watched with a great deal of interest all summer and when with its rosy cheek we thought it was ready to be taken from the tree we gathered it and wrapped it in a woolen cloth, put it into a dark place to ripen. After a few days it was examined and it was decided to be already to test; the family was called together and the pear cut, it was a Clapp's Favorite and perhaps you can imagine its condition, it had a shell and that was all. That "tree peddler" will always be remembered, so that if we expect to make fruit raising profitable either in money or pleasure, we should be very cautious where we get stock for setting.

As to varieties, have quite a number of kinds for home use for it is noticeable that those families that are dependent on the market for a supply of apples usually have but one variety in their fruit dish and it is "Hobson's choice, those or none" while the fruit dish of the farmer's or fruit raiser's family will have a half dozen different varieties and it is a great satisfaction to hear one member of the family say, I prefer this kind, taking a Mother apple; another says, a Spy is good enough for me, and still another, I'll take a Bellflower, and so on, each with a fancy of his own. Such an experience is worth just as much in a family when apples are worth but $1.00 per barrel as it is when they are quoted at $5.00 and costs no more. Beyond what is wanted for the family have two or three good commercial varieties, so that if there is a demand for the surplus stock it is worth much more by being all of one or two kinds, as buyers prefer to handle large lots of single varieties rather than small lots of many kinds.

In setting the trees the greatest care is necessary to get the lines straight. So far as the planting goes a tree can be set just as well in five minutes after the hole is dug as to be a half hour doing it, but it takes two to do it and do it well. The first few shovelfuls should be worked around the roots by hand and then when the large roots are covered step right into the hole and tread the soil down just as fast as your attendant can shovel it in. In some localities where exposed to bleak winds in two or three years there will be a tendency in some of the trees to lean a little out of line. It is a good way in such cases, just as the frost is out of the ground in the spring to move the trees back into line and brace them up and by the time the growing season is over it will be all right without the brace. In shaping the top and pruning, the habits of growth of the different varieties should be kept in mind that you may work with and assist nature to produce as nearly a perfect tree of its kind as it is possible to do. Pruning, like weeding, takes care of the small branches and the large ones will take care of themselves.

It will soon become a source of pleasure to look a tree over every time you visit it with your pocket knife in hand, and if necessary take off a little twig here and there, and when the tree gets to be a few years old you will take a genuine satisfaction in reflecting that you have formed that tree just about to suit your ideas of what a tree should be, a satisfaction that would cost lots of solid cash to purchase; it is the same sort of satisfaction that a man gets when he pays $100,000 for a trotting horse, just as satisfying to the mind of man as many things that are purchased with the cash that the fruit brings. And to make sure that your outlay so far shall pay regular dividends you must give it care and dressing, for a neglected fruit tree will never have a thrifty, tidy appearance. When the orchard comes to bearing if it has been kept in the condition described, it will not be in debt to the man that has cared for it, one cent; he has got his pay as he went along A person that enjoys such work, as he will after he gets interested in it, could not, in our opinion buy more genuine pleasure in any other way with the money that it has cost. From such an orchard there will be a large proportion of No. 1 fruit that can be readily exchanged for cash and be sure to send an occasional barrel to some poor family. The reward is ample; it will pay in the end; you will have pleasant memories in the decline of life that money cannot buy. So that in looking at the picture in all its bearings, not only with the apple but the pear, plums and small fruits, the rewards for our labors are ample taking health and pleasure at a low cash value. Even if we get but one dollar per barrel I see no cause for discouragement to the one that is thoroughly interested in his work.

There will be many half-hearted ones that will either drop out by the way or fail to give the business that care and attention that success calls for to give a fair remuneration even in dollars and cents.

DISCUSSION.

Prof. Cook of Manchester participated in the talk and took occasion to severely condemn the practice of marketing inferior fruit. Others who took part were Messrs. Gerrish, Wheeler, Warren, Pope, Gilbert, Clifford and Prof. Munson. Several speakers expressed strong opinions against New York nursery stock, saying that Maine trees skillfully grown were far superior, and suffered far less in transplanting. Others on account of the difficulty of obtaining good Maine trees said it was better to purchase New York trees of reliable nurserymen

Mr. GILBERT. I do not believe in the cultivation of the Flemish Beauty. In quality, when well grown, it is one of our best pears, but in recent years it has cracked so badly as to nearly ruin the fruit.

Prof. MUNSON. It is too bad to lose so good a pear as the Flemish Beauty. There is a belief that spraying for the fungus that causes the cracks will prove an effective remedy. It is worth saving and we hope to do it.

Mr CLIFFORD. Some years ago I was induced by the fine plates to order a few trees of an agent who called upon me. The trees grew well in my garden, and I enjoyed watching them very much. In the course of years they began to bear fruit. The Flemish Beauty is a beautiful tree, it bears an abundance of fruit, but I regret to state to you that the fruit is barely large enough to show the cracks. I hope the wisdom of you fruit growers will teach me what to do with my trees. Mr. John Pike of Cornish raises pears successfully and in years past has brought fine fruit to our market. One of these varieties is the Flemish Beauty. From this it appears that while my fruit is ruined by the scab, he and others are not troubled by it. Whether it is due to his treatment or to the favorable condition of his soil I am unable to say.

OUR EXHIBITIONS.

By D. H. KNOWLTON, Farmington.

Thoreau says, "Every man is entitled to come to cattle show." This idea is so popular that people by the thousands leave the farms and the shops and the desk and hie away to the fair. It is an inexpensive outing where people come together for a little recreation. A prominent man tells us it is no place to gain a person's attention in a business way, for all are "on pleasure bent." We often think in this connection that recrea ion is made altogether too prominent, that there is a little too much horse trot and too little agriculture. The management of most fairs entertain the idea that there must be sport for the crowd and they seek to secure it by the horse trot. We do not object to a horse trot, but we doubt the wisdom of making it the most prominent feature of the fairs. The writer has noticed that as the horse trot is given prominence other important features are lost sight of and in some instances have entirely disappeared.

It is a pleasure to see a crowd of people at a fair. They are out to see their friends, to shake hands with one another and to enjoy themselves. The outing will do them good no doubt, and they will go home all the better for it.

But whatever may be said of the fairs in other respects the most important features connected with them are competition and education. A generous competition is in itself a source of education. For as a man shows his products by the side of his neighbor's he is able to judge of a rival's qualities. If they are better than his own, he recognizes them and whether he wins the prize or not he goes home a wiser man. In other words he has gained some knowledge that in future years will develop into some power greatly to his advantage.

If there has been an evolution anywhere in the affairs of men it may be found in the modern agricultural fair. Originally the fair in European countries was a place of barter. From this, in America, it has grown into an exhibition combining many attractions, in order to give it popularity and insure a large attendance. We may now say fairs are held for the purpose of (1) traffic, (2) recreation, (3) competition and (4) education. Traffic for a time was nearly lost sight of but now it is among stock growers and breeders an important feature of our fairs. Without any clamor or display many animals change hands at the fairs, and in this way many people are able to improve their stock.

At the last annual exhibition our Society awarded premiums to the amount of $562, while the State Agricultural Society, with whom we held the exhibition awarded $5,530. The smaller sum represents all the fruits and flowers and with a hundred dollars or such a matter from the larger sum, the products of the soil seem to have a very small encouragement. It may be all right for the animal industries to have the major part of the premiums but a question is suggested whether the discrimination may not in the end work an injury to the cause it is intended to benefit most.

But that which concerns us most is our own exhibition and to that I wish now to call your attention. It has been the purpose of the officers, so far as possible, to make it a complete exhibition of Maine fruits and flowers, so that people from other states who visit the fair may have an intelligent idea of the wide range the State has of these products. Further than this there has been an effort to arrange the exhibition so as to make it attractive and pleasant for the visitors. For one, it is my belief that it should be as near a perfect model as possible, but there are so many details connected with it, it is difficult to make the exhibition in this respect what it should be. As illustrative of this, arranging the fruit, *i. e.*, putting it in the place assigned to it, often requires a large amount of work and were it not for the willingness of exhibitors to assist the officers it would be an exceedingly difficult task. For many years it has been a special work of the Society to correct the names of fruit, when wrongly named, and each year there seems to be just about as much confusion of names as ever before. The canned fruits and preserves have been a troublesome class of exhibits to care for, but the last two years the best results have been reached in the history of the Society. These and the fruits likely to be stolen by those disposed to yield to temptations at such times have been exhibited with satisfactory result behind poultry netting. The display has lost nothing and the articles have been safe.

Although we have made special efforts to secure an exhibition of fruit from all parts of the State, no county collections of apples have been shown in recent years from Hancock, Piscataquis, Washington and York counties. It would be a pleasure to see fruit from these counties, as we have the very best reason for supposing good apples are raised in each county. Of one thing we are certain if we know what they do raise, the Society may be able to be of more service to them than in the past.

A condition of our collective exhibitions is that there shall be not less than *twenty* nor more than *forty* correctly named varieties of apples. While we have had many fine collections of fruit in the past, it seems to me that it might be better to change the numbers, making the less number *fifteen* and the larger *thirty*, but as a further condition requiring that the collection shall consist of standard apples. Possibly it would be a good plan to limit the collections to varieties for which the Society offers premiums for single plates. In this connection I have also thought it might be proper for the Society to offer a premium for collections of fruit not enumerated in our premiums for single plates. The objects of such premiums would be first to show the varieties grown in the State and second to aid in the identification of varieties. The Society in this way can largely extend its influence without encouraging the production of more varieties. Make it a department visitors would examine for names and information. Great care should be taken to have them correctly named. In these times when hundreds of tree agents are selling nursery stock such an exhibition would be of great service, for it may be important to know what not to plant as well as to have the affirmative knowledge.

Last year the Society offered premiums for forty four varieties of apples. Five specimens of each variety were required, except where special premiums were offered, and of these twelve specimens of each were required. The specials were offered for Baldwin, Northern Spy, Gravenstein, Rhode Island Greening, Roxbury Russet. Tompkins King. It would be a grand idea as fast as funds permit to add other varieties of standard fruits to the special list.

As yet we do not believe the perfect apple has been found. There are many Maine seedlings of merit of which little is known, and if the collection of apples (those not named in our list) does not bring them out for exhibition the Society should take further measures to secure this most desirable result There are several seedlings of Maine origin that have great merit. Among them are the Rolfe. Wealthy (grown from Maine seed), King Sweet, and others we might enumerate. Careful examination of our seedlings may give us an apple of the shipping qualities of the Ben Davis and the sprightly flavor of the Northern Spy. If such a seedling does not grow in Maine, a little encouragement by our Society might lead to its propagation in the future.

Of the other departments of our exhibition I will only add a few words concerning the flowers. The past few years our agricultural organizations have been urging the passage of laws requiring the study of the natural sciences as related to agriculture in the public schools. Laws have been passed requiring it, and in many parts of the State agriculture is being studied in the schools. In this connection our Society has offered for several years premiums for botanical work upon our Maine flora, the conditions requiring an exhibition of correctly named specimens of dried or cut wild flowers. There have been several good exhibitions, but we are not satisfied with the results, for the competition should be more general. It is possible the premiums should be larger, but our funds will hardly permit of this.

For several years the Massachusetts Horticultural Society has done an excellent work in window gardening. It has given the children in Boston potted plants in the spring with a few cultural directions to aid them in their care. In the autumn the children brought back the plants for exhibition, and to those whose plants were found to be the best cared for, etc., small cash premiums were awarded. The children learned to love and care for the plants, and in many cases the plants cheered the sick with their beautiful flowers and the suffering was much easier to bear. But more than all this the children learned many things about plants and what make them grow. As one result, it is claimed that many homes, otherwise cheerless and forlorn, are adorned with beautiful plants, which are tenderly cared for by the children. More than all this we believe the children are better and happier for the care they bestow upon the plants.

This work is one I have watched with deep interest for I know how much the little folks may learn of the wonderful works of nature, if only a guiding hand may lead them. It is surprising how a little knowledge gained of one plant will teach the child to study others, and step by step as the child develops there come new powers of observation, until the child acquires the habit of observing everything in nature. The plant, the tree, the flower and every living thing leads on the child until there comes the question what makes the plant grow and the flower bloom? Life then becomes real to the child, and the great source of life naturally becomes the object of love and worship.

We ought never to be quite satisfied with what we are doing, for with each year's experience we ought to be able to do a little more and to do it just a little better. And this suggests whether our Society may not undertake some such work with the children in Lewiston and Auburn. It might be small in the beginning, but this need not deter, for if the means will permit we have only to advance step by step. Should we be the agency through which the children may be led to love the care and study of plants, or should a desolate home be cheered by some floral beauty, our work would be of unmeasured worth. It would be like the leaven of the Scriptures; yea, it would crown the Society with floral tributes and adorn the hearts of the children with beautiful and loving thoughts of the Great Creator.

God might have bade the earth bring forth
Enough for great and small,
The oak-tree and the cedar-tree,
Without a flower at all.
We might have had enough, enough
For every want of ours,
For luxury, medicine, and toil,
And yet have had no flowers.

Then wherefore, wherefore were they made,
All dyed with rainbow light,
All fashioned with supremest grace
Upspringing day and night;—
Springing in valleys green and low,
And on the mountains high,
And in the silent wilderness
Where no man passes by?

Our outward life requires them not,—
Then wherefore had they birth?—
To minister delight to man,
To beautify the earth;
To comfort man,—to whisper hope,
Whene'er his faith is dim,
For who so careth for the flowers,
Will care much more for him.

MARY HOWITT.

DISCUSSION.

Mr. POPE. There is great confusion in the nomenclature of our apples. This is sometimes amusing and sometimes annoying. For example the Gravenstein is often confused with the Duchess of Oldenburg, and the name of "Mann Apple" is given to numerous varieties. It would be a help if the Society could do more to correct the names now wrongly given to many fruits in the State.

Prof. MUNSON. There are good seedlings in Maine, and we ought to encourage the growth and originating of new varieties. In this way our fruit is improved. Who knows what the future may bring forth in this direction?

Mr. BRIGGS. The number of varieties is now so large that some extensive growers of fruit are deterred from making collective exhibitions. Twenty varieties—the minimum number—may be too large, and I am not sure but we would have more exhibitions if the number of varieties should be limited from fifteen to thirty, instead of twenty to forty.

Mr. POPE. I doubt whether it would be practicable to make out a list of twenty or more varieties, and require the collective exhibits to be composed of these varieties. The difficulty is to make a list that would be adapted to all parts of the State.

Mr. GILBERT. It has always been the custom of the Society to admit all varieties, thus affording a complete display of good and bad alike. In this way we are able to learn what to preserve and what to discard. It should be remembered that the old varieties are still the best and it will be a long while before we have anything better. It is a vicious practice we are getting of viewing apples solely with reference to their shipping qualities. There must be some other qualities as well as these. Let us give prominence to their qualities.

Mr. POPE. The Society has followed the practice of limiting the premiums so far as possible to the best varieties, and from time to time the premium list has been amended with this in view. Inferior varieties have been struck out and more desirable ones substituted in their place.

Mr. MCKEEN. I am very glad this matter of the study of the natural sciences in our common schools has come up here. I have been very much interested in the remarks of Mr. Knowlton and I most certainly wish to endorse and emphasize them. I have for a long time, looked upon the absence of the study of botany, physiology and their kindred studies from our schools as a matter of regret and more especially, the absence of anything which might enable our young people, the boys and girls of our farms to learn something of the character, the structure and the nature of the plants, the grasses and the trees of our fields and forests. Growing up in the midst of nature's beauties and her grandness, they are as ignorant of them as though they did not exist. "Seeing they do not see, and hearing they do not hear." To this lack of simple study into the hidden processes of nature's work-shop, in which we live, must be laid the general tendency of our boys and girls to leave their farm homes, those homes which must have something of a peculiarly strong and potent character about them, which must have woven into their very centers some subtle force of which the world knows but little, because there is constantly going out from them an ever increasing reinforcement to the ranks of our business men and of those who wield the power of the nation; reaching like the tendrils of the trailing vine into every avenue of our nature, the center being the farm homes of our nation.

In order to increase this feeling and put our business on a level with the other industries of our country it becomes necessary to have the means for obtaining accurate information into the hidden processes of nature, for our young people, in school and workshop. As far as the idea has been pushed, the results have been highly satisfactory. The pupils are ready for this new departure and will grasp eagerly any opportunity that may present itself to learn the mysteries of field and flower.

So I say to the officers of the Pomological Society, and all others who are interested in this noble work, you are on the right track, let nothing turn you from it, you may meet with opposition from even the very classes your efforts tend to aid, but a decided stand and a constant placing before all, the results of your labors will overcome every opposition and you will have the pleasure of scoring, at no distant date, a complete success, and of seeing the teaching of the simple, natural sciences a part of the course in every school in our State.

OUR CHOSEN FAMILY.

By WILLIS A. LUCE, South Union.

What a number of pictures does memory present to us when we bring before the mind the word family. Instinctively we turn toward our own home and see father, mother, brothers, sisters, as we recall them in the earlier associations of life. Then we note other families familiar to us by ties of friendship, and it has been a pleasing pastime to study the characteristics of these several families and the circumstances under which they were developed. We might select from the prominent families of history one for our chosen family, whose virtues we might strive to imitate as the family of Abraham, but that would not fulfil the purpose of this paper however interesting and profitable such study might be.

The word family has quite a general signification throughout nature and natural objects. Thus we speak of certain noted animals as belonging to such a family; having characteristics intensified by careful breeding whether it be for butter, beef, strength or speed. It also embraces language. And we often mention a group of similar character as forming a family. Thus we have in the aggregate of our State a family of counties. This meeting then in some respects might properly be called a family reunion by representatives, as York county is the parent of all the counties of our noble State, embracing as it did prior to 1760 the whole area of Maine. It is not unlikely that our efficient secretary in arranging for this meeting, thought we ought to visit our parent in the interest of pomology and agriculture and see how she is prospering.

I sincerely hope it may be a rallying point in the interest of those subjects we have to present that we may be of mutual benefit to one another. To one who loves the State of Maine, this family of counties in which our homes are embraced would present to look into its history and development an inexhaustible source for thought. But whatever choice others may have of family and family ties that of the Maine State Pomological Society culminates in the Rose Family. This group is coeval with man and honorable mention was made of a member 3,000 years ago in these words: "As the apple-tree among the trees of the wood so is my beloved among the sons. I sat me down under his shadow with great delight and his fruit was sweet to my taste." (Song of Solomon, 2:3.) And I doubt not if we could have been permitted to see that wondrous garden of Eden we should have found our chosen family the largest in all that glorious domain. It seems somewhat singular that nearly all the important fruits of the temperate region should be embraced in this one group but it is true. We have a royal family indeed that would suit the fastidious taste of even Dr. Holmes.

The "Rose Family" then is the chosen one of this Society and it is that we may understand the characteristics and laws that govern the growth of its members (the apple, pear, plum and cherry, also the more lowly members, the strawberry, raspberry, blackberry and rose that gives the family its name) that so much thought and investigation is put forth. We see in these fruits which in our latitude cover the entire season the hand of an all-wise Creator, and the more we cultivate and study these choice gems of nature, the more do our hearts flow out in gratitude and love to the great "giver of every good and perfect gift."

While I am interested in, and grow to a greater or less extent, all the members of this family I have mentioned, what thoughts I present at this time will be upon the growth of those very humble ones known as small fruits and the rose. At nearly every meeting of this Society some prominent fruit grower of New Enlgand (as Mr. Augur and Hale of Connecticut and Dawes of our own S ate) has given a most excellent exposition of this subject. These men have had long experience, and those who have studied the reports of the Society have found valuable information in all these papers.

Allow me, Mr. President, to diverge a moment and speak of reports. What observation I have had would lead me to think that the reports of our societies are not valued as they should be. One often comes across them in out-of-the-way places, in heaps of rubbish, etc., and when opened they will snap with glad surprise, showing that they have never been opened before since they left the printers' hands. They must be studied in order to be of benefit to the farmers and fruit growers of Maine. Let us study then what mature minds with large experience give us through the reports.

But some one may raise the question why waste this valuable time on so insignificant a subject as small fruits. Surely no fruit is insignificant that can be raised, comparatively speaking, from the equator to the poles. I wrote Mr. Van Deman for statistics as to the value of the small fruit crop in this country for 1890, but I could not get them as they are not yet completed. We feel it our duty to keep this subject before you until every family in the State is fully supplied. The health of the people demand it. Listen to one of America's greatest pomologists, Marshall P. Wilder, on this point:

"Think once more, my friends, of the great blessings which you may confer on mankind by the multiplication of good fruits. Next to saving the soul is the saving of health, and I know of no better means than an abundant supply of ripe fruits. Fruits are the overflow of nature's bounty; gems from the skies which are dropped down to beautify the earth, charm the sight, gratify the taste, and minister to the enjoyment of life; and the more we realize this, the more shall we appreciate the Divine goodness to us, and the duty of providing them for others."

This duty the fruit growers of Maine met when in the year 1873 they organized the Maine State Pomological Society. Grand work have they done in promoting the growth of fruits in our State and showing the importance of the industry.

First among the small fruits or berries comes the strawberry both in season and demand, but before taking up its cultivation, as ours is a botanical family, we will look into the botany to a certain extent of the strawberry and other small fruits, as given by Gray. Its botanical name is *Fragaria* (named from the fragrance of its fruit). When we speak of fruit we mean the ripened ovary with its contents. Some fruits as they are commonly called are not fruits at all in the strict botanical sense. A strawberry, although one of the choicest of fruits in the common acceptation, is only an enlarged and pulpy receptacle, bearing the real fruits (that is the ripened pistils) scattered over its surface and too small to be much noticed. This small, dry achene is plainly a ripened ovary showing the remains of its style or stigma or the place from which it has fallen.

In the raspberry and blackberry each grain is a similar pistil in the flower, but unlike the pistil in the strawberry it ripens into a miniature stone fruit or *drupe*.

So in the strawberry we eat the receptacle or end of the flower stalk, in the raspberry a cluster of stone fruits, like cherries on a very small scale, and in the blackberry, both a juicy receptacle and a cluster of stone fruits covering it. We see again the wisdom of our Creator in the succession of fruits coming through the entire season.

CULTIVATION OF THE STRAWBERRY.

The light, sandy or gravelly soils are the least desirable, and the alluvial soils or those containing a larger percentage of vegetable mould the best. It ought to be worked two years to completely rot the sod, remove the white grub, and check the weeds.

To furnish an abundant supply of plant food, apply from twenty to forty cords of good manure to the acre, and plow in ten inches deep. This after being thoroughly cultivated and smoothed will give you a grand feeding ground for the strawberry. You may think this amount of manure excessive and that the stawberry is a rank feeder. It is not exhaustive to the soil but when we cover one season with growth and without added fertility get a crop of berries the next, you see plainly that there must be, to secure good results, a large amount of plant food in the soil Again this plant does a large amount of work in a very short time. We uncover the plants about the first of May and begin picking the last of June. Doing so much in so short time, putting forth the buds, blossoming, developing the fruit, ripening, all within about ten weeks, calls for an available and full supply of food.

VARIETIES.

There are a host of possibilities and often anticipated results in this one word that we never realize. There are failures here the same as in every other enterprise. Talk about varieties running out; they can't help it the way some people handle them. Give them a herd of Jerseys that would average twenty pounds of butter a week and they would run out in the same way. Improper care and an utter disregard of the laws that govern production. People often come to me asking for plants from an old bed. I tell them they can have all they want but they are good for nothing. It is better to pay a dollar a hundred for good plants than get these old ones for nothing

We want strong, vigorous stock to start with and then put all our powers at work to strengthen the good points, by selecting those nearest our ideal to propagate from. By this method a variety instead of running out may be wonderfully improved. For general cultivation I have never fruited a kind that would compare with Crescent in vigor of plant and yield of fruit. I have found a hermaphrodite sort at last, (Michel's Early) that is its equal in vigor of growth and from experiment station reports. should judge it to be a good companion for the Crescent in field culture, as it blossoms at the same time and produces a great amount of pollen. As a ru'e the hermaphrodite varieties are not so productive as the pistillates. I have known many failures among farmers in fruiting a fine bed of plants simply because they were a pistillate sort and no perfect flowering variety near. So after repeated failure they became discouraged. Several such instances have come to my notice the past year.

This is a point in the botany of flowers that farmers especially need to know, for many failures in crops may be traced directly to it.

LIST OF VARIETIES.

Hermaphrodite—Wilson, Sharpless, Jesse, Downing, Michel's Early, Gandy, Parker Earle, Bidwell, Belmont, May King, and Miner's Prolific.

Pistillate—Crescent, Bubach, Warfield, Farnsworth, Eureka, Manchester, and Middlefield.

DESCRIPTION OF VARIETIES.

Bubach: Makes runners slowly, but sets strong stocky plants. Fruit deep scarlet, average large. A very promising variety but rather soft for long shipment. Season late.

Wilson, Downing, Miner's and Manchester with me are more subject to leaf blight than any others. This weakens the plant so they do not mature a full crop and the fruit is dry and inferior. Some seasons when they are not affected they give a good crop of fine fruit especially the Wilson. Its firmness makes it a very superior berry for canning.

Sharpless: This is one of the strong-growing healthy sorts and with me takes the lead in size of fruit. It is inclined to green tips some seasons but not always. For best results it needs a deep, rich soil and plants not too thickly set.

Jesse: A seedling from Sharpless It resembles its parent in growth and size of fruit. It also needs a rich soil and then is only moderately productive. But the fruit is supurb in color, size and quality. Very healthy.

Eureka: This is a vigorous growing plant, not very stocky. Makes runners freely. Fruit bright red color and attractive. The past season it was troubled with leaf blight to some extent.

Warfield and Farnsworth: Vigorous growers. Strong, healthy plants.

Parker Earle and Michel's Early: Very promising.

Crescent: This variety is more extensively grown than any other, particularly in the North. It is early, hardy and productive. Fruit with me good both in size and quality. I always take it as a standard for judging other varieties. There are others b tter in quality, but they lack in some essential point, vigor, productiveness or are troubled with leaf blight. I always advise those who never have raised strawberries to start with Crescent and some good fertilizer. If a large berry is desired, use Sharpless or Jesse. If not, I think Michel's Early would give best results.

After the question of varieties is settled and you receive the plants get them into natural conditions as soon as possible. Do not leave them standing in water, but untie the bunches, moisten the roots and if your ground is not ready, heel them in somewhere protecting from sun. Wherever your fruit garden is arrange it so as to cultivate by horse power. In preparing the ground have the surface raked smooth or some plants will be set too high and others too low. In either case they would not grow well for the cultivator will either smo her them or they will dry out.

Be sure to have the rows straight so the cultivator may be run close to the plants. To secure t is either set by line or sight the rows through by stakes and run some heavy truck by the stakes to mark the row. For matted row system of growing have the rows three and one-half or four feet apart, plants from twelve to twenty inches in the row owing to vigor of growth. Mr. Augur in a paper read before the Massachusetts Horticultural Society, February 14, 1891, recommended the triple row system setting in rows three feet apart and one and one-half feet in the row, allowing each spring set plant to throw one strong runner on each side, rooting a single plant opposite the intervening spaces. In setting be sure and press the soil firmly about the roots, to insure a quick start. Soon as the buds appear cut them out, and let the plant get well established in its new quarters before letting the runners grow. After the runners get started spread them out over the surface as evenly as possible as the cultivator tends to bunch them. After the ground is frozen cover so as to just hide the plants between the rows, as well as over the plants, with some seedless material, clean straw, meadow hay or boughs. I like straw or hay best as it is much less labor and can be raked between the rows in the spring, checking the weeds and keeping the ground moist. This covering is not to protect from the cold. but the alternate freezing and thawing that injures the tender rootlets near the surface which are to do the work when spring opens.

PROFIT IN STRAWBERRIES.

I believe there is money to be made in fruit-growing and especially in strawberries They do not require a heavy outlay of money and give quick returns on labor and capital, desirable features in any business. I have no very remarkable reports of my own experience for the best that I have done on anything of a large scale is at the rate of 175 bushel crates to the acre or 125 bushels on three-fourths of an acre. This with about the same amount of dressing I would use for a crop of corn. If I had had the manure I should have used the amount I mentioned in this paper. Probably we put about twice the work on the piece that we should, had it been planted to corn. I sell my berries at the farm at an average of $3.50 a crate, giving $612 50 value of the berries at the farm for an acre. This looks like small business beside Mr. Augur of Connecticut and Barnard of Massachusetts, who get from four to five hundred bushels to the acre. Taking the medium, 450 bushels at twenty cents a basket, which I understand Mr Barnard gets under contract and what does it give? Fourteen thousand four hundred baskets at twenty cents gives $2,880 for the product of one acre. Do not think these results are accomplished by any haphazard work. It is science applied to fruit growing. The best I have ever done was to get twenty bushel crates from nine square rods This would be 355 bushels to the acre. I thought this a remarkable yield, and it was for Crescent and Sharpless under matted row system. For this is considered the poorest method for great results, yet the most convenient because of less work.

RASPBERRIES.

Next in succession comes the raspberry. This is a very easy fruit to raise. It does best in lighter soils than strawberry. Prepare the ground about the same and set plants three by six feet for matted row, six by six for hill culture. The roots of this plant run quite near the surface and after the plantation is well started give a liberal manuring and mulch heavy enough to choke weeds. This retains moisture for the roots and keeps the soil light. The principal work after this is to choke back the canes which are apt to increase too rapidly.

VARIETIES.

Marlboro: For early this is the leading variety Beautiful crimson color; hardy; not very firm; good for home use and home market.

Cuthbert: Leading market berry. Rather a late variety. Marlboro nearly through fruiting when this begins to ripen. Dull purplish color. Quite firm, fine flavor. Hardy.

Golden Queen: This is a very vigorous, hardy variety. In season about the same as Cuthbert. Remains in fruit a long time, which is a b autiful golden color; fine quality.

Shaffer's Colossal: Not hardy with us but when uninjured is very desirable.

Gregg: Black caps are not popular in my section so this is the only variety I have. They are really a fine fruit and very easily grown.

BLACKBERRIES.

Cultivation same as raspberries. Set plants 4x8 or 6x8 feet.

VARIETIES.

Snyder: One of the standard market sorts for the north. Hardy, fair quality, very productive. I have also the Agawam and Erie which are fine fruits. Forty and fifty bushels of raspberries and blackberries is considered a good yield per acre.

A man working a large farm has no business with small fruit growing beyond the full needs of his family. The strawberry and hay crop come together, and other fruits follow in quick succession. Neglect is bad for the hay, but when you neglect berries it means total loss. I believe in making a specialty of one and putting your whole heart in it. But every one who has land ought to raise small fruits for the family.

Specific list of fruits for family:

Strawberries,	50 Crescent,	.60	
	50 Sharpless,	.20	
Raspberries,	50 Marlboro,	.70	
	25 Golden Queen,	.50	
Blackberry,	50 Snyder,	1.00	
Gooseberry,	6 Houghton,	1.00	
Currant,	6 Cherry,	1.00	5.00

This may seem a small quantity of plants but with good cultivation they will yield a large amount of fruit.

THE ROSE.

President, Prince, Duchess, General, Baron, Duke, Earle, noted men and women of every age are represented in this branch of our chosen family even to our beloved Washington and the family "Belle."

QUEEN OF FLOWERS.

Delight of childhood, joy of middle life. solace of age. They minister to a thousand pleasing fancies. Not only do they crown the joy of the bride but as we send them to sick and afflicted they bear messages of love and sympathy. They also revive the heart by their beauty and fragrance. And when called to tender our last sad ministerings to departed friends in no way can we express our feelings so well as by these beautiful emblems of love and purity.

The cultivation of this plant has received a large share of attention the past decade and as a result some very choice new varieties. The climbers, Hybrid perpetual, and Moss are the most desirable for Maine, being hardy and embracing all the colors except yellow. This is found in the Persian Yellow which is a very beautiful rose.

Roses can be grown with little care; every one who wishes can have them. They ever respond in buds and flowers in proportion to the care we give them. The soil needs to be very rich. In making a rose bed, remove the soil the size you desire to the depth of two feet. Fill in one foot well rotted cow manure then a mixture of manure and rotted sod in which set the roses having them slightly lower than the surrounding surface that the moisture may not run off but sink about the roots. Most people set them too high. They need to be put well into the ground. Some of the best varieties.

Climbers { Baltimore Belle.
Gem of the Prairie.

For lawn { Marshall P. Wilder, Gen. Jacqueminot.
Paul Neyron, Crested Moss.
Baron De Rothschild, Mdme. Plantier, Persian Yellow.

The Polyantha or fairy roses are very beautiful, sweet and hardy. One other member of this family I must mention,

THE SPIREA.

A more beautiful hardy shrub it is hard to find. A real delight are its masses of white flowers. The most desirable is the Spirea Van Houtii.

It is stated that but one-third of the working class can profitably be engaged in agricultural pursuits. If this is the case many of the sons and daughters of the farmers of Maine will find some other vocation. If they must go how different will be the feelings of those reared among the refining influences of fruits and flowers, from those who have occupied some of these dreary country homes we often see. The first as they reflect upon their early life are filled with joyful recollections and with sadness do they leave the associations of childhood. The others are only too glad to escape from the disagreeable surroundings and work. Let us then surround our homes with the beauties of nature, fruits and flowers, so lovingly bestowed upon us that our sons and daughters may look back upon a childhood filled with happy memories.

DISCUSSION.

PROF. MUNSON The influence of the pollen is a matter of special interest and importance to the strawberry grower. An increase of pollen tends to increase the size of the fruit. This is thought to be the explanation of the wonderful productiveness of the Crescent Seedling when properly pollenized. There is much yet to be learned of the influence of the pollen upon the pistillate varieties. Of one thing we are quite sure and that is the necessity of having some perfect flowered variety growing near them. Size, quality and quantity are wonderfully increased in this way.

PEAR CULTURE.

By H. S. DAWES, Harrison.

I am aware that my subject is a dry one to most people, from the fact that so few in our State are interested and engaged in the cultivation of pears. I am also aware that the object of this meeting and Society is to interest, and extend its usefulness to those not engaged in the profitable and delightful occupation of fruit growing. I regret my inability to present the subject to you in its true merits, and to bring out anything new or interesting, for I find myself in the condition something as the good old lady was when engaged in making her soap, and one of her neighbors called in and asked her how she did it, replied that she could not tell how she made it, but it come by observation, and all I can tell you about pear culture is what I have observed and learned since I have been in the business. Give me a moist, thoroughly under-drained soil, I don't care whether it is clay, loam, gravelly or sandy, located on a fair elevation, and you can raise pears just as well here in Maine as you can anywhere in New England.

If you wish to engage in the business, I should select an acre, more or less, according to your circumstances, of such soil and location as I have described, and prepare it as follows: I should plow it as deep as you can, by going twice in the same furrow, and turn under a heavy coat of dressing. After you get it plowed, spread on another good coat of well decomposed barnyard manure, to make it rich enough to bear good corn without any fertilizer in the hill, and plant it to corn or potatoes the first season. After the crop is harvested in the fall, plow in another coat of barnyard dressing, also plow again the following spring, and if you give it another coat it won't hurt it. Harrow it over five or six times after each plowing, and cart off the rocks and other debris. It is no small job to prepare an acre suitable to grow pears, especially if the soil is rocky, but it does not pay to half do it. After you have given your ground the finishing touch with the smoothing harrow, it is all ready to lay out, and how shall it be done? That depends on the kind of trees you intend to plant. If you feel an interest in your posterity, and wish to benefit your heirs, I should set standard trees, twenty feet apart each way. But if you want to get the fruits of your own labor, and the largest possible profit from your acre, I should set dwarfs, ten feet apart each way. When I first commenced in the business, twenty-six years ago, I did not like the sound of dwarf trees, and looked on them as a curiosity that would do to set out in the flower garden. Accordingly, I set two on the edge as a novelty. One of them was a Duchess, and is a good, healthy bearing tree; the other was a Louise Bonne de Jersey, which bore itself to death, and died last year for the want of proper treatment. When they came into bearing, which they did after the third year, and I saw that there was nothing dwarf about the fruit, I began to change my mind, and did not care what they called the tree as long as it bore the largest fruit, the most of it, and almost invariably took the first premiums. My experience with those two trees, and about one hundred and fifty more, set ten years later, as compared with about the same number of standards, (as I have about an equal number of each,) has convinced me that you can get five times as much profit from an acre of dwarfs as you can from an acre of standards. I am so selfish that I want the benefit of my labor while I live, and don't care to invest, or recommend others to, in anything that does not promise quick returns and good profits. As a consequence, I have never invested in life insurance, and shall put no more money into standard pear trees.

After you have decided which kinds you will set, provide yourself with as many small stakes as you have trees to plant, and lay out your grounds. Drive your stakes just where you want each tree to stand when set, and be sure and have your rows straight, and the trees of equal distance each way. Dig the holes six inches deeper than you want the tree to set, and put the top soil in a pile by the edge of the hole, the bottom soil close to it, and have the diameter of the holes three and one-half to four feet. Be sure and replace the stakes, and keep them in line both ways. Provide leaf mold enough to apply half a wheelbarrow load to each tree, and dump it close to the edge of the hole, also five large shovels full of thoroughly decomposed barnyard manure, and put that beside the leaf mold. Having previously provided good, healthy trees, prepare them by pruning and cutting them back as they should be. Cut off all the bruised ends of the roots, take a wheelbarrow load of ashes, a bucket of water, a round stick two feet long, one and one-half inches in diameter, made on purpose to tamp the dirt around the roots, one man with hoe and shovel to set your trees. Fill up your hole with your best top soil and leaf mold, till you get it high enough so that your tree will stand just as you want it. Now remove the stake and set the tree in the same spot, taking care to keep it in line with the stakes. Commence to set your tree with your best soil and leaf mold, tamp it firmly around the roots, taking care to keep them in their natural position. When you have the tree two-thirds set, pour on a dipper of water and let it settle around the roots; fill up the hole with alternate layers of soil, leaf mold and manure, taking care not to have the manure come in contact with the roots, but leave it mostly on the outside edge of the hole for the future use of the tree in years to come. Spread on about two quarts of ashes near the surface when the tree is nearly set Scrape all the remaining soil, leaf mold and manure in a circle around the tree, treading it down firmly with your feet, and smooth it all off with a garden rake.

It costs something in money and labor to plant out a pear orchard as it should be. But do your work thorough, and you will have an orchard that you will feel proud of when it is done. The main object to keep in mind in setting out fruit trees of all kinds is to imitate nature, and provide the trees with such fertilizers as will make the soil as near the virgin state as possible, so as to stimulate them to a healthy as well as a vigorous growth. I know of no better way to do this than by making a liberal use of leaf mold, decomposed barnyard manure, and a few ashes when planting the trees. There is nothing equal to leaf mold for a mulch, and there is no danger of using too much of it.

When you procure your trees make a contract with some responsible nurseryman, or party, for just the kind of trees you want; specify the different varieties, all to be true to name, of the best, clean, healthy stock, and hold him to his agreement, or make him pay damages. You can get standards for fifty cents each, and dwarfs for twenty-five cents, and perhaps less and get good trees. Don't buy them of a tree peddler under any circumstances, for you will be just as likely to get one-half of them crab apple trees, and the other half you will not know any more about than you do of Blaine's health, or whether he is going to be a candidate or not, by reading the papers.

You will observe that it takes just 110 standard trees, set twenty feet apart each way, to plant an acre, which will cost, at fifty cents each, $55, and if you set dwarfs, ten feet apart each way, it will take 430 trees to plant an acre, just three dwarfs to one standard, and they will cost, at twenty-five cents each, about $108, making the cost if you set dwarfs, about $53 more for the trees than it will to plant it with standards; add to this $100 for fertilizers, labor, &c., will make your orchard, if you set dwarfs, cost you about $208, and if you plant standards it will cost about $150, and that amount, if you have any taste and gumption at all, will do it in first-class shape, and you will get good pay for your labor and fertilizers, and you will have an orchard, if you take care of it as it should be, that will prove to be a good investment and a source of pleasure and enjoyment.

With your orchard all set, the bulk of the labor and expense is over as it requires but very little labor and expense to keep it in order. The trees need but very little prunning except to keep the leading shoots cut back, so as to make the tree stocky with a symmetrical head. Keep the ground entirely clean of weeds, which is easily done, for you can cultivate both ways. Give them a good annual manuring round the trees after the third year, and for the first three years you can plant one row of beans or potatoes between each row of trees. After that they will commence to bear, and you should give them the benefit of the whole surface.

In regard to varieties much can be said, for their number is legion. But I shall only notice a few of the old, tried sorts that we know are good and pay the best, that do as well on the quince root as dwarfs, and let each individual experiment and test for himself as many kinds as he pleases. There are lots of pleasure and enjoyment in doing that, but more pleasure than money.

For a summer pear there has nothing yet been brought out that is equal to the Bartlett, all things considered, either for a standard or dwarf. It is an early and abundant bearer, yields good crops annually, and there is more money in it for me than there is in any other summer variety, and I should set one-fourth of an orchard to this sort.

For a fall pear I think, all things considered, there is more money in the Louise Bonne de Jersey than in any other. It is an annual bearer, does it best as a dwarf, and is one of the best selling pears in the market. Its worst fault is it tendency to overbear, and the fruit must be thinned to save the trees and have the fruit mature to perfection. The trees are more subject to blight than most others, but with all its faults I should set fully one-half of my orchard with this sort Next comes the Duchess d' Angouleme, which is one of the best if not the best, to cultivate as a dwarf. It is a good annual bearer, the tree remarkably free from disease, the fruit needs but little thinning, is of the largest size, sells well in the market, and when fully matured and ripened is of first quality. Its worst fault is that in some seasons, and under certain conditions that I cannot explain, it does not mature and ripen all of its fruit fully, and then there is little to choose between one and a turnip. You will notice that I have limited you to three varieties, for my object has been for profit rather than pleasure, and if you have that in view I don't think you will regret it.

I will now give you a little of my experience with insects and diseases. In regard to insects I can tell you but little, for I am no entomologist. I have never taken much interest in their origin and life history. I cannot tell you much about microbes, bacteria, trypetas, etc., for I never went a gunning for such small game, and if you wish to know more concerning them, I will refer you to Prof. Harvey and some of those experts at Orono, who will furnish you with all the scientific and reliable information you desire. I read in the papers not long since, how many thousand microbes there are under a person's finger nails, and my daughter thought, if that was so, that mine must be badly infested. I have directed my efforts more to find out some remedy to get rid of them, rather than to spend time looking through a compound microscope to study their genealogy and habits. My pear trees have never been troubled much with insects, except the codling moths, and you can easily handle them by spraying judiciously with Paris green. But the disease called the blight, or sun scald (some say that it is an insect), has been a serious one, and I have lost quite a number of trees by it. I have tried all the remedies that I could hear of, and made all sorts of applications, all to no effect, and I became thoroughly disgusted, and concluded that they amounted to nothing, or I wan't much of a doctor. For a while I tried to console myself with the thought that it is an irrevocable decree of our Creator, that, in His appointed time, all men, animals, vegetation, and even the world itself shall perish, and that I ought not to expect that a dwarf pear tree would be an exception But I found that something must be done, or I should lose all my trees before their appointed time came. So, on further reflection, I thought I would try once more, on my own hook, and go it blind. I went on the principle that an ounce of preventive is worth a pound of cure.

I had previously observed that by slitting the bark from the main limbs down to the ground, the new bark that formed was very smooth and healthy, and it seemed to open a new vein of life, so to speak, in the tree. I also recollect that when I was a boy and attended the town school, my mother used to have me wear a small bag of sulphur as a preventive to certain contagious diseases that were prevalent in the district, and the thought occurred to me that something might be done to prevent a healthy tree from being attacked with the fatal disease. So I adopted what I call the Chinese remedy. I have heard it said that in China they only pay the doctor as long as he keeps you well, and when you become sick his pay stops, and if you are very sick he loses his head; and if your tree is badly affected you will lose its head and feet both, and the sooner you dig it up and burn it, the better. My preventive consists in slitting the bark, and common white wash with ten pounds of sulphur thoroughly mixed with fifty gallons of the wash, and applied to the trees in the spring when the buds are swelling. I first have my man go along and slit the bark from the main limbs down to the ground. I then follow with a large pail of the wash, with a Lewis pump attached to the bottom, and spray the top of the tree. Another man follows with the wash and applies it with a brush to the main limbs and the trunk, so that the tree is completely whitewashed from top to bottom. It wants to be applied in the spring, before the tree leaves out. It does not injure the buds or the tender foliage in the least. I made my first application three years ago last spring, and have not seen the least symptom of the disease on a single tree that was treated. I also applied it to two trees that were affected so badly that I had to cut off one-half of the branches, and they have fully recovered. I wish to be distinctly understood that I only recommend it as a preventive applied to healthy trees every spring, in connection with the slitting of the bark, and not as a remedy. There may have been other conditions why the trees have not been affected, that I do not understand, and I do not recommend it as a sure preventive, but simply give you the result of my experiment, for what it is worth. But my faith in it is so strong that I am willing to risk my reputation as to its success, provided you don't let the trees overbear, and it is applied every spring, and the trees are properly fed and cared for. If a tree overbears two or three crops it will die, and I don't believe all the doctors in the world can apply any remedy that will save it. There is nothing that you can do to your trees that pays so well, and gives so good results, as thinning the fruit, especially those sorts that are inclined to overbear, like the Louise Bonne de Jersey, Bartlett, and some others.

Pears, like individuals, all need about the same soil and cultivation, but their quality depends almost entirely on the manner they are treated and handled. I think sometimes that a man that is not a good judge of human nature, cannot succeed in cultivating them, so varied are their habits and the modes of handling them. The first specimens of fruit grown on young trees of some sorts, are as good, if not better, than they are after the trees get older. Others, you cannot tell anything about the quality of the fruit by the specimens first grown, and the fruit only arrives to perfection as the tree matures. Almost all of the summer and fall pears want to be picked while they are hard and green, and ripened in a warm, dark place in masses. A parrel of pears headed up tight, will ripen up and be of much finer flavor than they will to be turned down loose on the floor and exposed to the air. The winter sorts want to hang on the trees as long as it is safe to let them without freezing; if they are picked before they are fully ripe they shrivel and lack flavor. I took a half bushel of Duchess, Louise Bonne de Jersey and Sheldon, last season to experiment with in ripening. I put part in the cellar, the rest in the attic, except a few that my wife put in the parlor. When we thought they were about right, we began to test them to see which were the best. We both agreed that those in the cellar were inferior every way to those in the attic, and I will say to all, don't put summer and autumn pears in the cellar to ripen. I could not see much difference between those in the parlor and attic, but my wife, whose taste is more acute than mine, insisted that those in the parlor were the better. I knew well that it was no use to argue the case, and I was glad to learn that she had found some practical use for such a needless and expensive luxury.

Somehow or other, the most of our farmers and pomologists have got the idea that they cannot raise pears here in Maine successfully as they do in Massachusetts, and so they don't try, and when I come to look around and see how few there are engaged in the business, and the way they do it, I don't wonder they think so. I believe there is something in the location and soil but vastly more in the treatment. I can raise pears almost as cheap as I can apples, and so far my pears have paid me a better profit than apples, and they would have paid far better if they had all been dwarf trees of the right sorts. All we lack is skilled labor, and those that have a taste for the business, to give our State as good a reputation for its pears as we now have for our apples.

A man whose taste is all horse, and spends half of his time in the stores and on the street corners talking about him, will not succeed in cultivating them in Maine, or anywhere else. The horse is a noble animal, and merits a high position in our industrial pursuits, but is it not a question worthy of the consideration of those who have the matter in charge, whether they are not giving him vastly more than he merits, to the expense and neglect of our other industries, considering all the demoralizing influences there are in connection with it? But this is no time and place to discuss the horse question. I have already wearied your patience too long. In conclusion, will say that I feel altogether out of place in trying to write and read papers before these professors, and this intelligent audience, for I was trained and educated to use the hoe, and not a pen. I trust that when our honorable secretary makes up his programme another year, he will employ an expert at the business, and not one who has to go to the dictionary as often as I do.

EXPERIMENTS IN SPRAYING.

By Prof. W. M. Munson, State College, Orono.

The number of the insect and fungous enemies of the fruit grower, and the magnitude of the damage caused by their attacks are sufficient reasons for considering certain methods of treatment at this time. While there are fluctuations in the severity of attack, it is patent to all that something must be done, or Maine will lose the proud position she holds as one of the finest apple states in the Union.

In Massachusetts, New York, and farther west, orchardists are fully alive to the importance of combatting these pests, and the practice of spraying with fungicides and insecticides is common. It is not to be supposed that conditions of soil or climate would render the work done in other parts of the country of no value as suggesting the proper course to pursue in our own State, but it has been thought best to prove for ourselves the effectiveness of the remedies, —if they are effective.

Unfortunately there are no large orchards in the vicinity of the college, hence we have labored somewhat at a disadvantage. Much credit is due to the gentlemen who gave the use of their orchards and so faithfully assisted in the work. I shall give as concisely as possible the results of the past season's work in the line of "experiments in spraying."

CODLING MOTH (*Carpocapsa Pomonella*).

A pest which is universal in the southern portion of the State, and one which in many sections is the most serious we have to meet, is the larva of the codling moth. I say in the southern part of the State, for I am informed by growers in northern Aroostook that this pest has not yet reached them. No doubt all are familiar with the larva as it appears in the fruit. The moth itself is small, and very delicate. As it seldom flies during the day, it is not often seen unless one is searching for it.

IS SPRAYING WITH PARIS GREEN A PREVENTIVE?

To answer this question, trees were sprayed in the orchards of Messrs. W. P. Atherton of Hallowell, Charles S. Pope of Manchester, and F. M. Woodward of Winthrop.

In Mr. Atherton's orchard a row of Rhode Island Greenings, and a row of Hubbardston Nonsuch were selected. Four of the Greening trees were sprayed with Paris green in the proportion of 1 pound to 250 gallons of water; an equal number in the proportion of 1 pound to 300 gallons, and three trees were left unsprayed.

Of the Hubbardston, one tree was sprayed with the mixture of 1 pound to 250 gallons, two in the proportion of 1 pound to 300 gallons, and two were left unsprayed.

Two applications were made. The first one, June 11th, just as the last blossoms were falling was under my own supervision. A second application was made by Mr. Atherton two weeks later.

The fruit was gathered October 3d. With the help at command we were unable to gather the fruit from all of the trees. Therefore in case of the Greenings, two trees of each lot were taken, reference being given to the relative size and productiveness of the tree so far as possible. All of the fruit was picked from the trees, and all that had dropped was gathered separately.

Table 1 indicates the comparative results.

TABLE I. A. RHODE ISLAND GREENING.

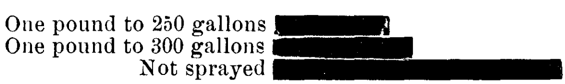
Treatment.	Whole number of fruits.	Number worry.	Per cent wormy.	Average per cent wormy.
A. R. I. GREENING.				
ONE POUND TO 250 GALLONS.				
First Tree.				
Picked	453	39		
Fallen	67	18		
Total	520	57	10.96	
Second Tree.				
Picked	727	25	-	7.14
Fallen	98	14		
Total	825	39	4.72	
ONE POUND TO 300 GALLONS.				
First Tree.				
Picked	1069	101		
Fallen	165	53		
Total	1234	154	12.48	
Second Tree.				
Picked	1100	47	-	10.08
Fallen	145	49		
Total	1245	96	7.71	
NOT SPRAYED.				
First Tree.				
Picked	1195	124		
Fallen	228	114		
Total	1423	238	16.02	
Second Tree.				
Picked	556	73	-	20.11
Fallen	253	138		
Total	809	211	26.08	

TABLE I. B. HUBBARDSTON.

Treatment.	Whole number of fruits.	Number wormy.	Per cent wormy.	Average per cent wormy.
ONE POUND TO 250 GALLONS.				
Picked	773	13		
Fallen	36	28		
Total	809	41	5.06	5.06
ONE POUND TO 300 GALLONS.				
First Tree.				
Picked	681	11		
Fallen	33	22		
Total	714	33	4.62	
Second Tree.				
Picked	836	75	-	10.04
Fallen	83	56		
Total	919	131	14.25	
NOT SPRAYED.				
Picked	652	145		
Fallen	169	122		
Total	821	267	32.52	32.52

It will be observed that none of the trees were very seriously attacked. The unsprayed trees having an average of but about twenty per cent of wormy fruit. All sprayed trees had a smaller percentage of wormy fruit than did the unsprayed, but the best results were obtained from the stronger solution. The number of fallen fruits was greatly lessened by spraying, and the proportion of wormy fruits among the windfalls was much smaller in case of the sprayed trees.

The figure gives a graphic representation of the results.



A number of Greening trees in another orchard, some distance from the first, was sprayed June 11th, and June 25th, with Paris green in the proportion of 1 pound to 250 gallons. In this orchard, three hundred fruits were taken indiscriminately from all parts of each tree. The percentage of wormy fruits, while not absolutely final, may be regarded as a fair basis for comparison. The trees were in parallel rows, thirty feet apart.

TABLE II.

	Sprayed.			Not Sprayed.		
	Number fruits	Number wormy.	Per cent wormy	Number fruits.	Number wormy	Per cent wormy.
First tree	300	44	14.7	200	74	37.0
Second tree ..	300	40	13.3	300	113	37.7
Third tree ...	300	20	6.7	300	85	28.3

As will be seen, more than one-third, (34 per cent) of the fruit on the unsprayed trees was wormy, while only one-ninth (11.5 per cent) was wormy on the sprayed trees. In other words, spraying the trees twice with Paris green saved more than one-fifth (22.5 per cent) of the crop. It had been our purpose to spray some of the trees three times, but as the land was in the meadow, the third application was omitted.

From a consideration of the trees already mentioned, and also of a number of Baldwin trees from which all of the windfalls were gathered and counted, we conclude that the average percentage of fallen fruit from the unsprayed trees is nearly double that from the sprayed trees. With the Hubbardston, the difference was even more marked. (See table I)

In order that we might have as many checks on our work as possible, Mr. Charles S. Pope of Manchester, undertook to spray a portion of his orchard with Paris green. One application only, was made June 25th, when the fruits were about the size of acorns.

Table III indicates the results obtained.

TABLE III.

Variety.	Sprayed. Whole number of fruits.	Sprayed. Perfect.	Sprayed. Wormy.	Sprayed. Per cent wormy	Not Sprayed. Whole number fruits	Not Sprayed. Perfect.	Not Sprayed. Wormy.	Not Sprayed. Per cent wormy.	Ratio sprayed to unsprayed trees.	Remarks.
TALMAN'S.......	344	274	70	20.3	392	226	166	42.3	1:2.07	All the fruits were picked from the trees, and all from the ground that had fallen within two weeks.
(1 lb. to 320 gal)	397	308	89	22.4	681	371	310	45.5		
BALDWIN	451	403	48	10.6	431	338	93	21.6	1:1.61	About 2½ bushels from all parts of each tree.
(1 lb to 240 gal.)	409	349	60	14.6	462	374	88	19.0		

No comparison between the two mixtures can be drawn as the trees were not in adjacent parts of the orchard. It will be seen, however, that in both instances there is a marked difference in favor of the sprayed trees.

As indicated in the table, the ratio between the sprayed and the unsprayed Talman trees, is as 1:2.07. In other words, for every wormy fruit on the sprayed trees, there were more than two wormy fruits on the unsprayed. Or, if there were 100 wormy fruits in a barrel of apples from the sprayed trees, there would be 207 in a barrel from the unsprayed. In the same way, for every 100 wormy apples on the Baldwin trees which were sprayed, there were 161 on the trees not sprayed. As a rule, it was observed that the difference in favor of the spray was most marked on trees bearing relatively few fruits—a fact of no small importance in an "off year."

Negative Results: Incidental to some other experiments a few trees were sprayed in an orchard belonging to F. M. Woodward of Winthrop. The work was conducted by Mr. C. E. Moore.

When spraying for the apple scab, certain trees were sprayed once with a mixture of Paris green and carbonate of copper in suspension. The poison was used in the proportion of one pound to 160 gallons of water. The trees were old, and were surrounded by unsprayed trees.

About three bushels of fruit were counted from each of four trees with the following results:

Sprayed.			Unsprayed.		
Sound.	Wormy	Per cent wormy.	Sound.	Wormy.	Per cent wormy.
387	93	19.3	480	75	13.5
218	86	28.2	394	159	28.5

As will be seen, the results are indifferent or negative. The conditions were such, however, that little reliance can be placed on this test.

In no case was the foliage of the sprayed trees injured by the weaker mixture. Some Baldwin trees sprayed freely with a mixture of the strength of one pound of Paris green to 200 gallons water, were considerably scorched, however. In the use of Paris green or London purple it has been found that a fine, evenly divided spray is less liable to cause injury than is a coarse spray.

As a rule, Paris green is to be preferred to London purple, as it is less variable in character and is less liable to damage the foliage.

In general, we conclude from the results of the past season's work: Spraying with Paris green is effective in greatly reducing the injury from attacks of codling moth. A mixture so dilute as one pound of the poison to 320 gallons of water, may be effective. A mixture of the proportion of one pound of poison to 250 gallons of water was more effective, in some instances.

The use of a mixture of the strength of one pound to 200 gallons water endangers the foliage unless carefully applied.

IS SPRAYED FRUIT UNWHOLESOME?

The objection is frequently raised that fruit which has been sprayed is unsafe for food; that enough poison will adhere to render the fruit dangerous.

The matter has attracted some attention in England recently, and there has been an outcry against American apples. One of the Boston papers last winter quoted a writer in the *Horticultural Times* of London, as saying: "It is admitted that this insecticide (arsenic) is used upon the fruit itself until it is completely saturated; that it is applied to the fruit several times before it reaches maturity, and if the weather continues dry, the arsenic clings to the fruit and what is not absorbed through the skin remains on it, forming a fine coating which must evidently be detrimental to health, especially where the fruit is consumed to any extent. If the American apple, as it comes from the vessel is carefully rubbed with the finger, it will be seen that a fine delicate powder in most cases is removed. This is the arsenic adhering to the skin."

There certainly is no doubt that fruit from which a coating of arsenic may be rubbed with the finger would be very unwholesome if eaten in large quantities. The trouble with the objection is, the fine white powder *is not Paris green.* I have yet to see the fruit which at maturity showed any visible effect of spraying, except comparative freedom from worminess.

The statement made by the Boston paper, and by certain of the shippers consulted, concerning the time of spraying is as misleading as is the statement of the English Journal, though in the opposite direction. The statement is made, that the trees are sprayed "only when in blossom, as the purpose is to get at the insect which gets in there." Now we know that this statement is entirely wrong. Spraying is never commenced, or should never be, until after the blossoms fall. The position of our English cousins is weak, and it is unnecessary to go beyond the facts of the case to prove the weakness.

The strongest mixture recommended is one pound to 200 gallons water. Personally I think one pound to 250 gallons strong enough. If we apply two gallons of the mixture to a single tree, we should use, approximately one one-hundredth of a pound, or seventy grains of the poison on the whole tree, at each application. The fruits are so small at the time of spraying, that it would be impossible to make as much as five per cent of the poison stay on them. There is not sufficient surface to retain a larger amount. But, even supposing this proportion correct, and that the trees are sprayed twice, if there are 1200 fruits—about three barrels—to the tree, the amount of poison per fruit would be less than three one-thousandth grain (.0029).

But in our calculations we have not taken into account the fact that the fruit is exposed to sunshine and rain for four months before it is ready for use, and I am not sure but Professor Riley was about right when he expressed the opinion that "it would be necessary for a man to be able to eat fifty bushels of apples in order to get an appreciable amount of arsenic into his system." There certainly is no reason why fruit sprayed as directed should be unwholesome when mature. The great danger from the use of Paris green lies in the methods of application. Great care should be used at this time.

WHEN TO SPRAY.

In general, the proper time for the first application is just after the fruit has formed, and for the second, some two or three weeks later.

In no case should any spraying be done while the trees are in blossom. It is too early to be of any value whatever in checking the work of the codling larvæ, and very serious damage may be done in poisoning the bees which are very abundant at that season. Not only the bees themselves are killed but the honey is rendered unfit for use.

There are two broods of larvæ during the season, but we usually make special effort to check the first one. If this one is held in check, the second one will necessarily be less harmful. The time when the first brood commences depredations is not fully settled by entomologists, but it certainly extends over a considerable period, and varies with the season. It seems not improbable that we shall find that in practice certain varieties will need to be sprayed earlier than others.

APPLE SCAB (*Fusicladium dentriticum*).

I doubt not most of those present are only too familiar with the dark colored spots or "scabs" which appear on some varieties of apples, notably the Fameuse and the Maiden's Blush.

These spots represent but one stage in the life history of a plant which grows on and obtains its nourishment from the apple. Its attack is not confined to the fruit, and it sometimes causes very serious loss to the orchardist. The plant is known to botanists as *Fusicladium dentriticum*. It belongs to a group of parasitic fungi.

Sometimes in very cool, wet seasons, the fungus spreads very rapidly, and attacks the foliage and young fruit early in the season, causing almost total loss of the crop, and greatly weakening the trees. If the attack is late, after the season's growth is completed, no special damage is done, except to injure the fruit.

The disease appears on the leaves as brownish or olive colored spots. These spots, if numerous, run together, become blackish in color, and finally the leaf tissue dies.

For several seasons past, experiments have been conducted in various states for the purpose of determining a successful method of combatting the disease. It has been found that in many instances great benefit is derived from the use of some of the compounds of copper in solution.

During the past season a series of experiments was planned with the purpose of determining on an extended scale, the effectiveness of certain mixtures, and some of the problems relative to methods of application. The latter portion of the work was carried on largely in the orchard of F. M. Woodward of Winthrop, the work being conducted by Mr. C. E. Moore. Owing to local conditions, most of the problems relating to methods of application remain unsolved. Though much credit is due Mr. Moore for the faithfulness with which he attended to the spraying.

In regard to the effectiveness of spraying with copper compounds in checking the apple scab, results were eminently satisfactory. In the orchards of our President, Mr Pope of Manchester, fifty nine trees were sprayed with various mixtures and a suitable number of trees were left without treatment to serve as checks. The trees were of medium size, and bore from one to three barrels of fruit. The time at command was so limited, that not all of the trees could be examined critically. But a sufficient number was examined to give a good basis for our conclusions. Four different mixtures were used:

A. A modified form of *eau celeste*, made by dissolving two pounds sulphate of copper ("Blue stone"), and two pints strong ammonia, and for use diluting to twenty-eight gallons.

B. Ammonio-copper carbonate solution—three ounces carbonate of copper dissolved in one quart ammonia. Diluted to thirty gallons for use.

C. The same as B, except that only two ounces of copper was used.

D. Carbonate of copper in suspension. Two ounces carbonate of copper placed in twenty-five gallons of water.

Table IV gives the average results obtained from the examination of several trees sprayed with each solution, and of the unsprayed trees.

TABLE IV.

Treatment.	Average number fruit examined per tree	Free from scab.	Slightly scabby.	Badly scabbed.	Worthless.	Per cent free.	Per cent No 1 fruit (as regards scabs)	Remarks.
Solution A..	459	262	125	57	12	57.00	85.0	Sprayed May 11 and June 15.
" B..	802	383	339	78	6	41.75	90.0	Sprayed May 22, June 15 and July 28.
" C..	720	237	364	109	10	32.09	83.5	Sprayed May 22 and June 15.
" D..	576	24	138	278	133	4.1	28.1	Part sprayed once, part three times. No apparent difference.
Not sprayed.	729	30	157	332	210	4.1	25.6	

As will be seen, there is a marked difference in every instance save one, in favor of the sprayed trees. The highest per cent of fruit entirely free from scab, was obtained from the use of the *eau celeste*, the gain being fifty-two and nine-tenths per cent, or more than half of the crop.

The greatest actual gain so far as marketable fruit is concerned, however, was obtained from the use of the stronger ammoniacal solution of copper carbonate. The actual increase of No. 1 fruit amounting to nearly sixty-five per cent. It is quite possible that this difference is largely due to the later application of this solution.

The results obtained from the use of the copper carbonate in suspension, will not warrant us in advising that mixture. Other tests were made in Mr. Pope's orchards, as also in Mr. Woodward's orchard at Winthrop. The indications in every instance pointing toward marked benefit from the use of the copper solutions.

As showing the necessity of doing something to check the disease, I may note the condition of certain trees in Mr. Woodward's orchard.

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	Number examined.	Free from scab.	Slightly scabby	Badly scabbed.	Worthless.	Per cent free.	Per cent No. 1 fruits.	
Copper carbonate in suspension (check)	492	3	123	257	108	.6	25.6	Average of three trees.
Ammonio-copper carbonate.	556	19	184	264	86	3.4	36.5	Average of two trees.

The trees sprayed with copper carbonate in suspension were treated twice—May 21st, and June 12th. The other trees were sprayed but once, June 15.

As will be seen, this orchard was very severely attacked. Some trees were absolutely without a perfect fruit, and only one-fourth of the crop could be made to pass as "No. 1" fruit, even with the loose methods too often practiced in sorting.

In general, we conclude from the season's work,

1st. Spraying with the copper compounds is beneficial in checking the attacks of the apple scab. The increase in No. 1 fruit amounting in many cases to nearly sixty-five per cent.

2d. There is little difference in value between the modified *eau celeste* and the ammoniacal solution of copper carbonate. The materials for the former are always obtainable hence in some respects this will be more commonly used.

3d. Simple carbonate of copper in suspension has no marked effect on the fungus.

4th. A large proportion of the fruit attacked was but slightly affected, the attack being recent. It appears probable, therefore, that spraying later in the season will prove beneficial.

HOW TO PREPARE THE MIXTURES.

1. *Modified eau celeste*—Dissolve two pounds sulphate of copper ("Blue stone") in two gallons hot water. In another vessel dissolve two pounds carbonate of soda ("sal-soda"); mix the two solutions and add one pint strong ammonia. When ready for use, dilute to twenty-eight gallons. The copper sulphate should be dissolved in a wooden vessel as zinc or iron will corrode.

2. *Ammonio-copper carbonate solution*—The most satisfactory formula used during the present season was:

Three ounces copper carbonate—One quart ammonia, thirty gallons water.

Dissolve the copper carbonate in the ammonia, and add to the desired amount of water. In some instances where the ammonia is very strong—26° Baumé—the foliage is scorched, unless the mixture is more dilute. With 26° ammonia dilute to thirty-five gallons.

In preparing either of these mixtures, it is well to make the stock solution the day before applying, and to make a considerable quantity—merely observing the proportions suggested.

The ingredients of the first solution may be obtained at any local drug store. Carbonate of copper, and ammonia in bulk may be obtained of Weeks & Potter, Boston, Eimer & Amend, New York, W. S. Powell & Co., Baltimore, Md.

Copper carbonate will cost about fifty cents per pound. Ammonia by the carboy, of eighty pounds, costs nine cents per pound. Sulphate of copper costs about ten cents per pound.

APPARATUS.

Good force pumps with suitable spraying nozzles are now obtainable at very reasonable prices. We have been very well pleased with the "Perfection," manufactured by the Field Force Pump Company, of Lockport, N. Y. This pump has a discharge pipe returning to the bottom of the barrel, thus keeping the mixture agitated. The pump with brass cylinder and plunger costs $12.00.

Good pumps may also be obtained of the Gould Manufacturing Company, Seneca Falls, N. Y.

On general principles, the "Climax" nozzle manufactured by the Nixon Nozzle & Machine Company, Dayton, Ohio, is the best. That is, the spray is more finely divided, than is the case with some others; but the nozzle is so small, too much time is consumed at each tree.

When well made, the "Graduating Spray" nozzle which comes with the "Perfection" outfit is very satisfactory. We find that nozzels of this description as obtained from different dealers, are not uniformly good.

In applying Paris green, it is important that the spray be finely divided, but with the copper solutions, it is doubtful if the finer spray, and the saving in the quantity of material, will compensate for the longer time required in using the Climax nozzle.

Under no circumstances is it advisable to purchase a pump with iron cylinder and plunger. The iron will quickly rust, and unless very carefully handled, the pump will be ruined the first year.

With most pumps only five or six feet of discharge pipe are sent. It is advisable in all cases to have at least ten feet of hose, that the top of the tree may be easily reached. This is of special importance in using Paris green, as with the short discharge pipe, there is danger of poisoning from contact with the spray.

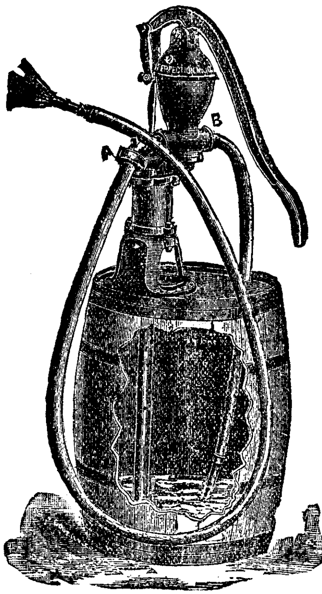

FIG. 4.
"Perfection" Spraying Outfit.

Figure 4 represents the "Perfection" outfit. This is the pump we have used in most of our field work. The pump is supplied with about ten feet of hose, and also has a second discharge pipe returning to the bottom of the barrel, thus keeping the mixture agitated. The cost of the pump with brass cylinder and plunger is $11.50. It is manufactured by the Field Force Pump Co., Lockport, N. Y Other pumps of a similar style may be obtained of the Gould Manufacturing Co., Seneca Falls, N. Y., also of Rumsey & Co., of the same place.

In large orchards it is no small task to work the pump be hand and there is a demand on the part of owners of such orchards for a labor-saving device. To meet this demand, several styles of pumps with automatic gearing, have been constructed. One of these, the "Victor," made by the same company as the "Perfection" outfit is shown in figure 5.

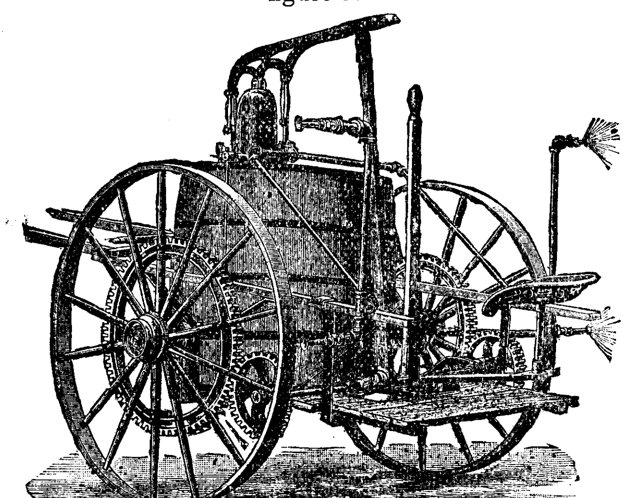

FIG. 5. The "Victor."

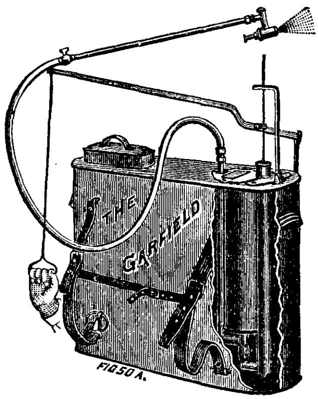

FIG. 7.

Figure 7 represents the form made by the Field Force Pump Company, at a cost of $14.00. There are several other pumps not greatly unlike this, which sell at about the same price. The *Eureka,* manufactured by Adamson & Son, Washington, D. C., is an excellent pump, but is more expensive than the others, costing $21.00. The knapsack sprayers are specially valuable in the small fruit and vegetable gardens, for spraying currant bushes or potato vines.

CONCLUSION.

I have given you in a general way the results of the past season's work in combatting two of the most serious orchard pests. We have seen that almost without exception the indications are that by the judicious use of Paris green, the work of the apple worm may be largely controlled. This conclusion is not based on a single isolated experiment, but on the average of several tests, conducted under different conditions, in various orchards. There is no ground for fear in the use of the sprayed fruit after maturity, but caution should be used at all times.

We have also seen that by the use of some of the compounds of copper, the attack of the apple scab may be held in check. That the amount of "No. 1" fruit, may be increased in this way to a very marked degree, ranging from ten to sixty-five per cent.

It is not our purpose to relinquish the work at this point. There are many problems still to solve. It is hoped, however, that the results already accomplished will be the means of inducing many of our orchardists to undertake some of this work for themselves.

DISCUSSION.

Prof. COOK. I have watched with great interest the progress made in spraying fruit trees the past season. The experiments made in Mr. Pope's orchard under the direction of Prof. Munson were carefully conducted, and the figures the professor has given you may be safely accepted as not showing more than was actually accomplished. If we can learn an inexpensive method of destroying, for example the apple scab, it will be of much advantage to fruit growers. This apple scab is working great injury to the fruit interests of Maine.

Mr. DAWES. My experience in spraying thus far confirms all that Prof. Munson claims in the destruction of the codling worm. The great difficulty is to find the mixture that will do the work wanted without scorching the leaves.

H. W. BROWN. In our orchards the past season we have sprayed with great success. A neighbor, whose farm is next to ours did not spray at all. He had more than double the wormy apples we had. He said we drove all the worms into his orchard.

Sec'y KNOWLTON. While I am well aware of the important results reached in spraying, at the same time I am in sympathy with the cautions thrown out at some of our previous meetings. It requires but little skill to use Paris green successfully, but there are few of us who in its early use have not injured the foliage which we sought to protect from insects. Use it by all means if thereby you can produce better apples, and I believe you can; but before making a general application be sure you know *how much*, or perhaps *how little* is necessary to do the work successfully. All the time it is being used it should be borne in mind that we are handling a deadly poison, and that a mistake may prove fatal either to man or foliage.

GRAPE GROWING.

HENRY W. BROWN. The past season I have been in Massachusetts on a small farm in Concord. There we have no trouble in raising grapes successfully. In fact, for several weeks the past season Massachusetts grapes were about the only grapes in the Boston market. The vines are set in rows about six or seven feet apart and about the same distance in the rows. Wires are fastened to posts or strong stakes for the vines to run on. The ground is thoroughly cultivated between the rows, and bone meal and some form of potash are worked into the soil. No winter protection is given them. The vines are trimmed so as to make new wood for the next year's crop, the new growth being cut back to this. In trimming a vine it should be borne in mind that it is the new wood only that bears the fruit, so that the old wood after fruiting must be cut out also. It is the practice with Massachusetts growers now to girdle the bearing wood about the first of July or a little later. The branch is girdled so as to leave one or more buds between the part girdled and the vine. After the fruit is off, the branch is cut off at the point where it is girdled. By this operation the fruit matures earlier by two or three weeks, and is as good or even better. The market is better and in some of the later varieties it saves them from the frost.

The same method of pruning and training in my judgment will give Maine people good grapes in most seasons. But of course the season is shorter in Maine and only the earlier varieties can be grown with success. Moore's Early is one of the best for Maine. The Worden is the next. The Hayes, a small, light colored table grape, delicious to the palate, is also very good and deserves a place. The Niagara is another very good grape. The Green Mountain and Hartford Prolific are also good varieties for Maine.

Concord is the home of several popular varieties of grapes, among which are the Concord and Moore's Early. There may be found growing wild near by our farm grapes of excellent quality. Nurserymen from all parts of the county send to Concord growers for the Wood of Moore's Early, as well as for several other varieties. This wood in many cases pays a good profit. It is nothing more than the vines cut off in the autumn. One of our neighbors has sold his wood for more than $100 in a single season. This wood is used for cuttings by the nurserymen, from which new vines are propagated.

Mr. Gilbert. This matter of grape growing in Maine is a hazardous business and unprofitable. Only those favorably located can grow them successfully, and then only the earliest varieties are at all certain of ripening.

Pres. Pope. Many people are deceived by the highly colored plates shown by the tree agents and buy varieties that are worthless for Maine. It is better to find out from some Maine fruit growers the varieties that are known to do well in the State and then order direct of the nurserymen. The buyer in this way will be sure of the best varieties and quite sure to obtain what he orders.

THE MARKETING OF APPLES.

By CHAS. E. WHEELER, Chesterville.

One year ago when I visited your county for the first time and participated in the exercises of a Farmers' Institute in a town adjoining this, I took occasion to say: "That opportunities give us the privilege of accomplishing many things to enable us to gain the ascendency in producing articles of common use, and possessing such satisfactory qualities as to meet the tastes of the consumer which would have a tendency to increase the demand, and at the same time, establish a price which would be remunerative to the producer." And although the subject then under consideration was different from that just announced, the same rule may be safely applied.

In studying upon this subject the mind is allowed to believe that the basis for a safe and proper disposal of our fruit is found in the orchard where originally labor and expense have been satisfactorily applied, but through negligence and waste the product has been found so unworthy at times a nominal value only could be placed upon it. A comparison has been made between some of the orchards as they now exist, with a herd of choicely bred cows which the owner had procured at a large outlay of money, placed upon his farm which was well adapted for dairying purposes, and he confidently looked forward to the time when returns would come from the product of the dairy so pleasing and remunerative as to cause him to cheerfully reflect upon his sagacity and wisdom in the investment of his means. But alas! some ill-tempered laborer in his employ had exerted such a baneful influence over the herd as to utterly destroy its value for the purposes intended.

The reputation that may be gained in the disposal of any class of goods may be illustrated in the case of a retail dealer in flour who had sold a large quantity of a certain and satisfactory grade, and his trade was being continuously increased when the agent called upon him and after shrewdly alluding to the success which had attended him, offered to supply him with an indefinite amount of flour stamped with the same brand that had aided in selling former lots, and which had gained the confidence of the consumer, but was really of an inferior quality, and yet upon the merits of previous sales of the same brand a large amount of this poorer flour could be sold at the same rate as the other, but costing much less, and thereby increasing the profit of the retailer.

To a considerable extent Maine has enjoyed the reputation of producing some of the best fruit known to the trade; and if dealers and consumers could feel assured of obtaining what they bargain for, they would not higgle about the price paid. It is a lamentable fact that some packers, yea, many, and that term will doubtless include some who *grow* the fruit, will nearly fill the barrel with an inferior quality, taking care to place at the top some of the finest quality, then put on the head, marked in big letters, "*A No. 1*," and in due time send it to the market. How far removed is this practice from that attempted by the flour agent quoted above?

The question of supply and demand will regulate itself, but the principle of honest practice in the handling and marketing of fruit lies within the province of man to regulate and control, and the best methods to adopt on a matter worthy of the most candid and serious consideration.

It is claimed, and indeed it may be true, that this is an exceptional year in the matter of the disposal of our fruit. Even the most careful and honorable producers and dealers find the market in an unusually depressed condition, and yet at present prices no branch of farm husbandry, excepting possibly that of dairying, brings better returns. In my own individual case and it was no exception in the locality where I reside, one dollar per barrel was received as they were taken from the orchard, which included all grades, and no barrels furnished, the only expense being the picking, and in our case the drawing for the distance of two miles.

One of my neighbors has in cold storage his entire crop of '91, excepting the Harveys. He informs me that his fruit never grew in greater beauty and perfection than it did last season, and its present condition is very fine. With an outlook for high prices less encouraging than in former years, yet his anticipations for a satisfactory deal as the season advances are of such a nature as to cast rays of composure upon his countenance. And this, doubtless, is only one case in the many that exist in the different sections of our State.

But there are many small farmers, orchardists, scattered throughout the fruit growing belt of our domain who seem well nigh discouraged at the present aspect of affairs, and reason, not unwisely perhaps, that a repetition of this dull period in the market is liable to again occur, and having relied so fully upon the result of this, to them important factor, in the matter of ways and means, and having no other resource to aid in bridging over present emergencies, are unable to reconcile themselves to the arguments and theories advocated by prominent men connected with pomology in regard to a well regulated demand for fruit. And in aid of this class of producers my mind has of late been under pretty strict discipline, and I have come to the point that warrants my venturing an opinion in the form of a plan that if adopted may assist in establishing rates more equal and satisfactory than any now in use.

The Pomological Society has wisely held its meetings in various portions of the State, and through its speakers has advocated an advanced theory in the care of orchards and the preparation of its product for the market. The people have kindly received these teachings, and much improvement has been made. Some State societies have adopted rules that may seem arbitrary, but the result is proving the wisdom shown by such action. For instance, in one State the requirements for the dimensions of a barrel in which the fruit is to be packed, the quality of lumber used and its mode of preparation, and on this point one cannot be too particular. The largest grower of fruit in my county uses only new barrels made to order, every stave and heading planed, the hoops flat and nicely fitted, and when packed ready for market its appearance pleases the eye nearly as much as the contents will satisfy the consumer when it shall be opened in his larder.

Another State society prescribes a rule as to the size of the apple to be packed, as well as the color which shall adorn its surface. These may seem to many to be small points, but when you reflect upon the care, taste and skill manifested by the operators of our creameries and large private dairies, and contrast the demand, together with the firm prices obtained, with the old, haphazard way of doing things, it will not require much foresight to see the importance of exercising the greatest care and prudence in the management of this universal favorite among the people of the fruit-eating regions.

I therefore submit to this Society a proposition that its officers, or some committee chosen for the purpose, employ a competent person, to be denominated a head packer, if you please, who shall be located, together with suitable help, in one or more places in each of the counties where the quantity of fruit usually raised shall warrant the outlay, such person or persons to receive the fruit from the grower, sort and pack the same, make the sales and be responsible to those who bring the fruit in the payment for the same—the Society to receive a certain per cent to cover costs.

By making Portland a shipping centre, suitable storage room can be obtained, and when an agent from any large purchasing firm is in pursuit of a first-class article, those lots having the brand of the Society to recommend them will at once attract attention, and as its reputation for honest practice and deal may become established, it will prove a medium through which the average orchardist may dispose of his product, feeling sure that it stands an equal chance with that of his neighbor, and receive a corresponding amount as a result for his care and labor.

I have a strong and confiding faith in the future prosperity of our noble State. All I am, all I ever expect or hope to be is bound up in the possibilities, nay, the probabilities that are soon to be grasped. The earlier strivings of my ambition were directed in the line of securing a herd of thoroughbred Jerseys worthy a place on any farm, and success has attended my efforts. My next move was for an orchard, and after purchasing an outlying farm well located and adapted to my purpose, what leisure time I can command is devoted to the pleasing and encouraging work of both grafting and pruning as well as the transplanting of hundreds of trees that take kindly to the soil made ready to receive them. Whatever of weal or woe, therefore, that fickle nature or force of circumstances may bring to the country, I shall try and be prepared to meet the result, always looking forward to that long expected time when farmers will be the "kings of the land" and their reign usher in the day of universal prosperity.

MAINE APPLES IN THE ENGLISH MARKET.

By EDWARD PEAKE, Portland,
Shipping Agent of J. C. Houghton & Co., Liverpool and London.

Your secretary, Mr. Knowlton, has kindly suggested that I should make a few remarks upon "Maine Apples in the English Market," and it will afford me much pleasure to answer to the best of my ability any questions that the meeting may choose to put to me.

The demand in England for fruit of every description is an increasing one every year; the people of England getting more and more into the way of eating fruit regularly, and looking upon it as a necessary part of their diet.

No doubt growers think the prices that have ruled this season have been low but if it is taken into consideration that from the beginning of the season until the end of last week over one and one-fourth million barrels were shipped from United States and Canada to the United Kingdom it must, I think, be admitted that the prices paid by the English consumers have been very fair not to say good; and quite as high as could reasonably be expected under the circumstances. When it is remembered that to the price obtained by the grower here must be added the freight, and all charges and shipping expenses it can hardly be said that the prices paid in England have been extremely low.

The present season has proved the capabilities of the English market for the disposing of very large weekly shipments, and all present appearances seem to indicate that growers need have little fear, taking one season with another, of their crops not realizing remunerative prices. The very low prices of some of the fruit this season is accounted for by the fact that such fruit was of such quality that no one could reasonably expect it to return good results either in the English or any other market. The fruit of first quality has all along brought fair prices considering the excessively large shipments.

Usually the English market is well supplied with common fruit grown in England and on the continent of Europe. Had it not been that this season the supply of this fruit was smaller than usual the inferior Maine apples would have done much worse than has been the case.

It is very gratifying to find that there is a strong feeling growing up here that the very inferior fruit should not be sent across the water but be disposed of upon this side. As I am strongly convinced it would prove to the interest of growers both individually and collectively that only fruit of fair size and quality should be selected for shipment. This would reduce the quantity for shipment and the fruit shipped would procure better prices in consequence. The increased prices for the better quality shipped would, I should say, more than make up the loss on the inferior fruit through disposing of the latter here.

Independently of this, however, it would follow that if no inferior fruit were shipped Maine apples would further improve their great reputation and this would result in their having a higher relative value compared with apples from other parts than is the case at present.

This is undoubtedly a very important matter for the consideration of growers, and being much interested in the question I am much pleased to find such insistence being laid upon these facts at this meeting.

As regards the best varieties for shipment, the hard winter kinds are those in demand. The Baldwin, as you well know, stands first in the list, there being far more of this fruit shipped than anything else. This fruit has the great merit of standing handling well and upon the whole is about the most satisfactory fruit for export, being a great favorite and always in demand. Kings bring the highest prices of any Maine fruit, but it seems to be generally conceded the results to growers of this fruit are not as great as for Baldwins. Northern Spies, Greenings, Ben Davis, etc., also have a ready sale. The Ben Davis up to the present has done very well but it will not do to trust too much to this fruit maintaining its present position, as should shipments largely increase it is probable that present prices compared with other fruits would not be maintained.

I have only mentioned winter fruit as suitable for shipping because under present conditions of shipment the risk of sending fall fruit is so great that I always feel compelled to discourage the experiment of sending it. If it could be got over in good shape it no doubt would do well and give satisfactory results; but this is such an uncertainty as to approach the impracticable. The day may come when it will be possible to send by steamers provided with special holds and contrivances for keeping fruit cool but until then growers will do well to raise only such quantities of fall fruit as can readily be disposed of in the home markets.

As you can readily understand the barrels have a great deal of handling while in transit from the farm to the English market and it is absolutely necessary to have barrels of sufficient strength to carry the fruit in good shape.

As it is an advantage to have clean, neat looking packages new barrels are best if made sufficiently strong. It is, however, better to use flour barrels than new ones which are not equally as strong as a flour barrel. In this case great care should be used to have the barrels properly cleaned out and also to erase any old marks from the head so that when the barrel is put up it may look as neat and clean as possible.

All fruit sold in Liverpool is sold from the wharf or quay and not put into store. Samples are drawn from each lot and taken to the sale room where some of the barrels are turned out in the presence of the buyers at time of sale, and the buyers thus have every opportunity of properly appraising the fruit.

With respect to brands, some brands have a preference with the English buyers. The explanation of this is that the shippers of the brands referred to always take care to ship only No. 1 fruit under what may be termed their standard brand. For their shipments of second quality they use a different mark altogether. The brand of the first quality apples thus gets a better name than would be the case if the same brand were used for the best and inferior fruit.

The apples are sold at public auctions which are held three times a week. There is a large attendance of buyers from all parts of the country and thus is assured the highest prices being attained that the laws of supply and demand will permit of.

In conclusion I may say, that, in my opinion, the prospects for Maine apple growers are encouraging. The prices that have ruled this season have had the effect of largely increasing the consumption and this will have a good effect next season and the following years. There is every indication that the taste of the English people for fruit will increase every succeeding year.

DISCUSSION.

T. M. MERRILL. Reference was made by Mr. Peake to the barrels used for packing. I am satisfied with good, clean flour barrels, and I believe they are preferable to the new barrels made in this State. There is often much said against the buyer, and some try to make him responsible for the inferior quality of Maine apples that find their way to market. The buyer is no more to blame than the farmers, and most shippers would much rather have strictly No. 1 fruit than any other. But they have to buy the fruit as they find it and do the best they can with it.

Mr. GILBERT. If the shippers insisted on having first quality of fruit the farmers would be glad to furnish it. The shippers are too willing to pack No. 1 and No. 2 apples in the same barrel and in consequence the farmer is the sufferer. The improvement should be with the buyers. Let them improve their practices and require better work of the farmers.

FRUIT GROWING IN MAINE COMPARED WITH OTHER AGRICULTURAL INDUSTRIES.

By L. F. ABBOTT, Agricultural Editor, Lewiston Journal.

Taking up the subject in a general way, comparison may seem fair and just. But arguing from a given standpoint as applicable to the whole, and basing estimates of successful enterprise in fruit growing in one section of the State with other agricultural branches in another locality, hedged about by differing circumstances of location as affected by soil and climate, the comparison becomes unfair and misleading.

The truth of the matter is, in our grand old State of Maine there is such diversity in soil, climate and other modifying conditions, that comparison between those lines of industry requiring unlike environment for their full development, becomes unjust and out of place. Hence, what I have to say this evening will be largely in a general way, not drawing the lines too sharply, because in a State like ours, where industries are so varied and everything of the best, all, in one sense, are on a general level.

And again, in view of the diversity of our agricultural interests, and the development of those industries under the fostering care of the best government, both state and national, that long-suffering humanity ever found fault with, it will not be amiss to consider the general status of agriculture, as well as the agriculturist in Maine at the present time.

Special lines in agriculture in our State form vast industries in themselves. This may be said of dairying, fruit growing, market gardening, etc. But underlieing these, forming the basis of all, the great and paramount industry is the live stock of the farms of Maine.

The hay crop and the stock it fosters are the two great underlieing factors in economic agriculture in Maine and New England.

While on general principles we concede this as a whole, there are individual lines of work, forming large and growing industries in themselves. One of these is fruit growing. And if any one of the varied industries of the State can be said to be independent of all other industries it is this. But commercial orcharding has not arrived to that degree of prominence in Maine as to assert its independence of other interests. Hence, we generally find the orchard an adjunct to the farm where mixed husbandry forms the rule. It becomes, then, a matter of policy in agricultural operations as to which lines of industry to devote the greater attention. So in instituting comparisons between fruit growing and other industries carried on on the farms of Maine, we cannot, as I said before, draw the lines so closely as to be appropriate to every section of the State.

The individuality of the farmer comes in as a potent factor to determine the poise of financial preponderance. One will succeed admirably in caring for cows, and make a financial success of dairying, while he would be an utter failure as an orchardist.

It is very fashionable in times like the present to say that fruit growing does not pay. So the same may be said of every specialty of the farm at certain times. Orchardists say in seasons of full crops of fruit that the trees only bear every other year, and then the market is always so crowded with fruit when they have some for sale, that it hardly pays the expense of gathering and marketing. But this argument of crowded markets, and low prices, has been advanced against almost every crop grown upon the farm, and yet the owners grow these same crops, and make money enough to support their families, pay their taxes, and some of them a fair percentage besides.

A COUNTER PROPOSITION.

If I draw the line of comparison between one or all the varied industries of the farm and orcharding, I shall be met with a proposition something like this: Admitting that fruit is easier raised and that the profits are greater than realized in most farm commodities will not the inculcation of this idea stimulate to over-production of fruit, and prices run down so low, there will cease to be any profit in it? Take the season of '91, for instance. Our crop of fruit was a very large one throughout the country. But it so happened that apples in Europe were a light crop, so the foreign trade helps us out somewhat this year, but what would have been the condition of the apple market if the European crop of apples had been good last year?

It is admitted that here is a contingency that is likely to be met in the future. But it should not be overlooked that the rate of consumption of fruit is increasing in equal ratio with its production. Look at the export trade in apples this winter. Nearly a million and a quarter barrels of apples have already been shipped from this country to England, and the trade is still going on. There will be seasons when export trade will be less, of course, and full crops of fruit here will send the price down to a low figure, but we can rely upon one thing, this year's crop of fruit will not interfere with next year's crop.

In years of plenty the evaporator should be called into requisition to modify the condition of fruit and so enable the orchardist to hold it till better prices can be realized. This is being done.

A few days ago one of the largest orchardists in Maine, and one who makes orcharding the specialty of his farm, and has made it a grand success, wrote me as follows:

"It is hard to boom orcharding or feel very much elated in regard to it in years like the present, but crops that are perishable like apples, potatoes, etc., are subject to greater fluctuations in price than those that are not so perishable. The market is so extensive, and is still extending more and more for apples, that when there is a partial failure they will pay the intelligent orchardist four times as well as any other crop. Ever since I can remember there have been years that apples did not pay for harvesting. That was when but few were grown.

"Three years ago apples were more of a drug in the market than they are this year, but the two years following more than made up for it. I expect it will always be so, and I am not so much discouraged as some orchardists are, who, when there comes a good year, will be more elated than I shall.

"It is true that if it had not been for the European market, apples would have been worthless for sending to market, but I think we can always count on the European market later in the season, even when there is a large crop there, for their apples are gone early, and

I expect other markets will be opened up for our fruit, especially evaporated and canned apples. If we can compete with other portions of the country in anything we can in orcharding. Orchardists should be prepared so that, when prices are too low, they can put their apples in shape to keep till there is a call for them, by evaporating or canning, and I think by so doing they can make the business as profitable in any year as any other branch of farming.

"The best of apples can be raised in Maine on land that is not, at present, worth five dollars per acre. Not much capital required for the business, eh? Some brains though, and more perseverance."

By way of postscript he adds: "I have evaporated nine tons of apples this year and expect to evaporate more if prices of green apples should not improve."

Now, my friends, let me say right here that I believe in orcharding as an industry on Maine farms. And I will tell you why I believe in it. I will tell you, also, wherein it excels as a profitable factor in our Maine agricultural operations.

I do not believe every man who takes up the business simply for the money he thinks he sees in the near future, will succeed in fruit culture. Also the same may be said of most other specialties of the farm.

There is a necessity for special fitness and training for special objects. The careless man, the bungler, the easily discouraged and short-sighted farmer, will make a failure in orcharding, as he will be likely to in everything else, because he lacks application and faith in his work.

TWO ADVANTAGES.

There is a two-fold advantage to be derived from fruit culture, a point in its favor often over-looked by those engaged in it. Besides the value of the fruit grown, it increases the value of land. But I hear some one say, "I don't want to sell my farm." Perhaps not, just now, but hundreds do, just the same, and there are but few farm homes in Maine but some time in the past have changed hands, or will in the future.

Right here occurs to me one example. I know an old homestead in Androscoggin county where the late occupant, the second in lineal descent to foster the paternal acres a few years ago, when the family were in health, it seemed as though other generations in the line were likely to hand down the rich inheritance of a fine fruit farm.

Death came to this household and took the only son. The father, after a few years of carrying on the farm with hired labor, felt the care too much for his increasing years, so, after many misgivings and heart yearnings the old homestead passed into other hands. And it brought a good round price. Why? On account of its rich endowment of Baldwin apple trees.

Let me tell you about it. I know this homestead well. Happy have been the visits I have made there, and the memories of the hospitality shared under the roof-tree of this fine old mansion, built when Maine's pines were thickly standing, large and tall, over a large area of the State, are restful as a strain of music at twilight of a summer's day.

The fruit trees growing on this farm formed the main factor in its sale. And yet there was not a large orchard of bearing age on the farm. Strange as it may seem, yearly crops of 200 barrels, mainly Baldwin apples, were gathered and stored in the capacious fruit cellar.

Now you ask, "How can these things be?"

This is a high, rocky farm, with a soil richly endowed with the elements suited to orcharding. If you should ever go to the "Norlands" where the famous Washburn family of Livermore were cradled, to the beautiful eminence now surmounted with a quaint old homestead, the fine, modern family mansion, with a beautiful little church whose spire overtops the unique stone library building, you will be very near the old farm I speak of.

The rocks were cleared from the fields and these were so plenty that walls were built enclosing fields of four to six and ten acres. On the line of these walls were set native seedling trees some seven or eight feet from the wall. These trees were set about thirty feet apart on the line of the wall, the trees on the opposite side standing at a point midway between the trees of the former row.

These young trees were grafted in the branches or in the stock as the fancy of the owner led. These fields in the course of the regular rotation; oats or mixed grain, followed by dressing and planted to corn and potatoes, seeded to grass and clover again with wheat or barley, remaining in grass four or five years, then the round of rotation went on again.

These trees grew from this course of cultivation, as might be expected—they will grow over on these hills anyway—and became quite constant bearers, and give apples that keep till the frogs peep in April.

This old homestead was sold—others will be. But there may be many old homesteads that lack this one thing needful to attract a buyer and influence the paying of a large price.

A PERMANENT INVESTMENT.

It is a fact a good orchard will do more towards selling a farm for a high price than many other things which are a great deal more expensive. When a man puts out a lot of nice fruit trees he then and there makes a permanent improvement of great value.

I do not come here to encourage one line of farming to the disparagement of another. As I have attempted to show, education, situation, structure and quality of soil, and the thousand and one things which environ Maine farmers, are among the factors which should influence him in adopting special lines in agricultural pursuits.

Beef is low, yet I contend that on our natural grass farms, on our good corn-growing lands, we can still make money on beef.

The watchword of the farmer should be to cheapen the cost of production of all classes of commodities the farm produces. Cheaper beef, pork, butter, wool and mutton, and fruit. Two cents saved in cost of producing a pound of beef, pork or butter, is equal to the price enhanced to that amount.

Ex-Governor Hoard said at the late dairy conference at Auburn, that he hoped to see the day when good butter could be put into everybody's mouth for twenty cents a pound, and he still retain the same profit he was making at thirty cents a pound.

The same rules are applicable to orcharding and other lines of farming. We should be fitting ourselves to meet these conditions whatever the circumstances of markets may be. When the contrast comes before us we shall find that it is easier to gain a fair per cent of profit on a barrel of apples than on a pound of beef or butter. All the possibilities, even under the present large area devoted to orcharding, and the increased attention likely to be given fruit culture in the future, are directly in favor of orcharding over other special lines of agricultural industry applicable to Maine farms.

The markets of the world are open to us. When we begin to talk about a market for apples Maine holds the right of way. There are several reasons for this.

The excellence of Maine's winter fruit is conceded, its keeping qualities are equal to the best, and our climate is such that when the crop of the great apple growing regions a few degrees south of us are put upon the market, ours may remain a little longer in the cellar.

A DRAWBACK.

But there is one drawback to our prosperity in this line and this is an instance where the many suffer for the sins of the few. A class of orchardists and buyers commit a culpable wrong by fraudulent packing of fruit for market. Upon this point one of the largest apple buyers in Franklin county writes me. He says:

"I believe there has got to be a change in the way apples are packed for market or Maine will get left. On the whole, Maine fruit is packed the poorest in any state. This is not as it should be. We have the best fruit, and if the fruit could be packed honest, we could get a paying price any year. I know of a lot of apples that were shipped to Boston last fall and sold for $3 a barrel as soon as they arrived. The same parties have had the apples of this orchard for a number of years and they were sure of the packing and willing to pay for it.

"There are lots of apples that will not get to market this year just because their owners will not pack them as they should be. Buyers in such a season as this shun such lots. In seasons of scarcity the market will take most anything and pay something for it, but in seasons when fruit is selling slow and low, these distrustful lots are likely to get left, as they should be."

Honesty pays in the long run, while rascality like a boomerang, rebounds and injures both guilty and innocent. Intellectual obliquity is bad enough in these days of schools, but this boomerang of moral crookedness which barks the shins of the greater innocent number as well as the lesser guilty ones, must be overcome by the inculcation of honesty from principle and policy or individual interest. Most people will leave off sinning if they can make a dollar by it.

THE EDUCATIONAL IDEA.

The orchardist of the future will be educated in his special field. So too, may be said of other lines of agricultural industry, in fact, this is so in a large sense now; but the change in this respect has just begun. The time is coming when the fundamental principles of agriculture will be a part of the curriculum of all our schools. The age in which we live demands it.

Formerly, more than at the present day, mixed farming was practiced, wherein more than one of the varied industrial specialties were fostered. Later, progressive methods have lead to special lines in industrial practice.

The relations of one section of the country with another change with the progress of industrial ideas. Population increases and markets for all the products of the farm fluctuate and change. Methods of production, as well as the commodities produced, feel the force of twentieth century push and energy. This is true in relation to our stock, our butter and cheese, our apples and small fruits. The only thing for the Maine farmer to do, is to catch on and keep up with the procession.

This we have not done. The average agricultural mind is slow to appreciate the circumstances of environment. It takes a good deal of plowing, and sub-soiling, and harrowing and warming by the sunlight of progressive thought and ideas, before it comprehends that the procession is moving forward.

But the dawn of a better day is upon us. Farmers are reading more, thinking more, and above all, putting into practice the lessons they have learned by their research. Those great lights, the experiment stations and agricultural colleges, ably supported by the boards of agriculture and kindred associations fostered by the state and national governments are a power, which, sustained and reflected by the agricultural press, are working radical changes in thought, ideas and practice, as a whole, in New England agriculture.

Human thought is progressive. We that are older and have kept in touch with the spirit of progress and the environing forces which impels to the diffusion of light and knowledge, must admit that ideas are dominent in the destiny of the commonwealth which means the agriculturist, because he is the better half of the commonwealth.

For the reason I have stated we are in a transition period regarding agricultural technics. Old methods and obsolete notions have not all been discarded, nor will they be till the present white-headed generation has become obsolete. The old-fashioned, slip-shod farmers are not all gone ; but the new-fashioned broader brained—because a higher developed brain—farmer is just coming.

THE FORCE OF CIRCUMSTANCES.

The farmer of the earlier period adjusted his practice to his surroundings and his ideas developed accordingly. But his practice of necessity, in conformance to the laws of cause and effect, in time—though so slow the contemporary generation failed to discover it, perhaps—felt the influence of the wonder-working instrumentalities offered by the industrial idea in education, so now science, chemistry and capital, are the arbitrators in the readjustment of the old order with the new.

Under the old regime, drifting was the ideal in progressive industry, if such can be called progressive. But drifting is not progress. Inanition never transformed an atom or molecule into matter. Action is the law of progress in the natural world and must be in the physical and mental.

But the thought should not be entertained that this transition state is confined strictly to the agricultural class. It may be more apparent in this class because the last, perhaps, to become involved in a change any way.

The world of ideas is moving on in all departments, and changes are apparent in all departments of thought and research. Look at

EDUCATIONAL METHODS

of the present day as compared with twenty-five years ago. Then the youth of the farming districts were largely at the mercy of circumstances, and the intellectual obliquity of the farmer's boy or girl, was condoned and viewed as cause for pity and commiseration, on the part of those brought up under more favorable circumstances.

But to-day there is no excuse for the delinquent in intellectual training. The privileges accorded by our good commonwealth for the boy or girl to acquire an education are as free and almost as copious as the gracious sunlight which daily floods the universe.

There is culture and culture. The common school has been the foundation upon which this country has builded capacity and character, but as well as the work has been done, the change incident to industrial environment calls for a change in methods of mind-training. There must be a re-adjustment and a coalition, so to speak, of educational and industrial ideas. We are now on the edge of that time.

The older system needs to be supplemented by industrial and manual training. The Maine State Grange, and the Board of Agriculture joining hands, started a grand enterprise which culminated in the compilation of that grand little work by Prof. I. O. Winslow of St. Albans, this State, called the "Principles of Agriculture," for common schools, whereby the rudiments of agriculture are taught. This gets down to the root idea, and makes possible the orderly expansion of our educational system so that the State becomes so its citizens can make the most of it.

It is time the elementary theoretical in education gave way to the practical, that the vast army of our coming population who must live by labor, and upon the results of whose labor depends the welfare of our State and country, have educated hands as well as heads.

THE INDUSTRIAL IDEA

in education has a broad scope. It takes us beyond the range of the school room and college curriculum, to the farm, the shop and the various vocations that go to make up a busy life.

The foundation of every industrial business venture, is the market to be found for the products produced. The business world to-day runs in specialties. The idea is becoming prevalent in agricultural operations. Specialists in this branch or that carry the work to the highest state of perfection. This educational idea before spoken of comes into play here. But not affecting all alike for all are not nor will not be eminent in like lines of farming. The man who makes a success of dairying may not be especially interested in orcharding, and so on the other hand the successful orchardist would be a decided failure as a milk man and butter maker.

To be successful in any special line of work the rule holds good that the individual must have a love for that particular work. You can't stop a square hole with a round plug. There will be a leak at the corners. Special lines of industrial work call for special fitness for the work, as well as for special education of the idea to be consummated.

The industrial idea in education and training will overcome the disparity, in a large measure, which exists at the present time in relation to the co-ordination of agricultural specialties. This is to be the basis of much of education in the near future, as it is the training of our agricultural colleges at the present time. In the future, far more than in the past, the orchardist will be an educated specialist, educated in the practical units of the business.

HOW TO KEEP THE BOYS ON THE FARM.

By Prof. ELIJAH COOK, Manchester.

This question is often considered and it must be acknowledged to be important in all its bearings. The last census shows a rapid flocking to the cities from the country, a circumstance which bodes ill and ill only to all classes of people. To turn this tide in some measure and induce the young man while deciding upon his life work, to give the old homestead due consideration, is worthy of the best efforts of all those capable of influencing the people. The advantages of the farmer are many and great and are such as affect every part of his being. A writer in *Harper's Weekly* recently began an interesting article by saying that farmers are chronic grumblers, a statement which in the main I deny, and yet it contains truth enough to make it worthy of notice.

It is too often the case that the farmer gives the impression to his children that his business contains hardships seldom or never met with in the other occupations of life, and the advantages are not mentioned. He should be induced to magnify his calling. If all tillers of the soil would look about them to see how they can secure better returns for the expenditure of their energies and while adding to their incomes, add to the health, comfort and happiness of the family, the boys would have more love for the farm and its occpation. The people better appreciate the business of the farmer every year and the government is already doing much to provide him with better methods but not half as much as the importance of the subject demands.

Over seven hundred thousand dollars were given from public funds for the support of experiment stations in the United States last year. Large as this sum may seem it is only a little more than a cent for each of our population. We have over forty experiment stations and nearly four hundred trained men constantly seeking for ways of increasing the products of the farm at less expenditure of both money and labor. These stations have accomplished already that which will enable the farmers to greatly increase their annual income. The scientific principles discovered at the stations and disseminated by the institutes and pomological meetings ought not only to enlarge the farmer's purse but also to increase his love and reverence for the nobility of his calling.

Let the boy understand that the farmer is a manufacturer, the elements of plant life in the soil or in the fertilizers applied constitute his raw material, and that his finished product is neither toy nor ornament, but that which God intended should be used by man to subdue the earth and extend our civilization.

No gainful occupation in which man can engage is so calculated to develop an acquaintance with and reverence for the Creator as that of planting the seed and cultivating plant, fruit and flower. Said Mr. Barker, a year ago, I never cover a seed and watch its development without feeling grateful that my attention was ever called in that direction.

Every young man who is about to decide upon an occupation for life should consider very carefully the effect his occupation must necessarily have upon the mental, physical, and moral development of his family. There is no fact in history more certainly proven than that the farmer's son has far more chances of success than the son of the city merchant, banker or lawyer. He is surrounded by far less that is evil and he must receive some inspiration from the violet upon the ground, the butterfly in the air, the bird in the tree or the star twinkling above him. All of these have a voice that speaks to his soul from another land. It has been beautifully said, "Every flower is a tender thought, every field a beautiful picture, and every forest a fairy land."

A boy brought up on the farm who is industrious, thoughtful and inquisitive, finds in his occupation a liberal education. No business is more calculated to develop both mind and muscle, consequently we find nearly all the leaders at the bar, upon the rostrum and in the pulpit began life in the country. Volumes might be truly written to show the advantages of life devoted to agricultural pursuits, and could a large part of the mechanics, artisans and operatives but know how much more of all that is worth living for can be obtained upon the farm than in the city, we should hear no more of deserted homesteads, and the problem of vacant farms would find an easy solution.

Every day I become more and more convinced of the great advantages to be derived from institutes and societies of this character where we can come together and learn of each other the latest discoveries, the best methods and go home better prepared to prosecute our labors and to appreciate our work. When we realize the real blessings of rural life, and what the farm may be made to yield of comforts and enjoyments, as well as profits, and do what we can to interest the boy, it will take more than the allurements of the city to induce him to leave his home.

Unfortunately, it has been thought by some that any one knows enough for a farmer. No greater mistake could be made. No occupation in the world needs more intelligence and none is more conducive to education in its best sense or better fits a man to discharge all the duties of life than conducting the varied business of the farm. He enters into partnership with nature to manufacture from the elements of the soil and air, the magnificent fields of grain, the trees and bushes loaded with the luscious fruit, and those animals which graze upon our many hills, all of which are calculated to strengthen both mind and body, and give happiness to the soul.

To enter into business with such a partner for such a purpose, ought to give a man a thousand times more self-respect than to weigh out sugar and nutmegs, or to measure off calico at five cents a yard.

A few years ago a Mr. Lyon and his son came to my farm in the West to buy some steers. Upon looking them over carefully himself he said to his son, John, look them over and see if we can afford to pay that price. I said to him, "I am glad to see that you consult your son in matters of business." He replied, "He is young now but we are both rapidly growing older, and I shall soon pass off and want him to be accustomed to the business." There was no question about that son remaining on the farm.

Mr. Ellis of Belfast, one of the most successful farmers in the State, has two sons who approached him when quite young with the request that they might keep some sheep. He said, "Yes, you may keep as many as you wish on this condition, that you accurately weigh all you give them, both hay and grain, so you can tell me every week just how much they are costing you, and consequently at the end of the year you can tell me what you have gained or lost."

By such treatment those boys soon learned to take an interest in the farm and early acquire the habit of conducting their affairs in an accurate, business-like manner, which not only secured in them a love for the business, but made success doubly sure.

Unless a man's account shows a reasonable amount on the right side of the ledger at the close of the year, he cannot expect to make farming attractive to the son, or long expect him to remain at home.

To enable him to make his business profitable and satisfactory, nothing will do so much as the cultivation of fruit. How much is annually lost by neglecting the cultivation of apples, pears, plums, berries and grapes. Nothing a farmer can do will add so much to the comfort, happiness, health, and contentment of his family as a succession of all these fruits every day in the year; and the profits in the culture of fruit in Maine far surpass that of anything else cultivated here or elsewhere. Berries can be profitably raised at five cents a quart, they are far more profitable, in fact, at that price than hay, corn or potatoes, and the Maine producer is surrounded with markets offering twice or three times that price.

To the profits of the orchard when properly cared for, there is hardly any limit. I know a King apple tree of moderate size, which has not borne less than two barrels any year during the past five, and there are many other trees in the same neighborhood that do nearly as well. The only difference between this tree and others of the same sort is in the cultivation. An acre of such trees would produce at least one hundred barrels.

In an item published in two of our agricultural papers it is stated that a farm of only thirty acres produced about thirteen hundred dollars worth of grass, grain, vegetables and fruit. This was a good result for one man, better than is usually obtained; but two-thirds of this came from three or four acres of orchard and the other third from the remaining twenty-six or twenty-seven, and he probably put five times the labor on the rest of the farm that he did upon the orchard. Were twenty acres of his farm in apple trees, and well cultivated and fertilized, his income would have been four thousand instead of thirteen hundred dollars.

How easy it would be for three-fourths of our farmers to have twenty acres of good apple trees and receive at least an annual net income of fifteen hundred dollars a year. This is just as certain as it is that he could raise one hundred bushels of potatoes or twenty bushels of wheat. But, say some, "I know many orchards that do not yield a quarter of that amount." So do I, orchards where the trees are starving and in a few years will starve to death.

I examined an orchard a few months ago which had been set two years on land that would not produce five bushels of corn an acre without dressing, and the trees had received neither dressing, mulching, nor care of any kind. Fifteen or twenty years hence half or two-thirds of those trees will be alive and begin to bear a few scattering apples and that farmer will conclude that the profits in orcharding are all a humbug, and the boys will leave the farm to clerk in a store, work on a railroad, or peddle fish.

I have nothing to say of the profits of a neglected orchard. Profits usually turn to loss in any kind of business when neglect takes the place of care. Many of our farmers never fertilize the orchard at all and almost none enrich it enough. The time of half feeding any crop is fast passing away, and its exit should be hailed with delight by us all. No crop will pay better for a generous supply of food than the apple.

FIGURING FOR RESULTS.

Of the profits of orcharding in Maine the half has never been told. There is no way in the world in which a young man can lay the foundation for future wealth with so little risk as by fruit raising in this State. Suppose he secures a piece of land and sets every spring for ten or fifteen years one hundred of the best apple trees he can procure, tills and dresses them in the best manner, what will be the cost and what the result? The cost of the hundred trees, setting and care for the same, could be spared by almost any young man who is saving and industrious, and at the end of ten years the trees would begin to bear, and before he has arrived at the meridian of life his orchard would yield a splendid income and be worth a handsome fortune.

Such an undertaking has every element of success. The risk is reduced to a minimum; it can be accomplished at or near the home of his childhood, and the business is healthful to both body and soul. If he wished to make fruit culture his whole business from the beginning, he could unite with his orchard small fruits, and if this is properly done after the first or second year, he could make more from them than he could in the shop or factory, and it would be almost infinitely more satisfactory.

Parents should remember that the boy will soon be a man, and a little influence brought to bear upon him in the right way may make the difference between a successful and a ruined life. We should early give him something to rear or cultivate of his own.

How admirably this can be accomplished by giving him a piece of land, assisting and teaching him to cultivate small fruits, plums, pears and apples. He will have more interest in the farm, learn the ins and outs of fruit culture, furnish himself with clothes and partly, at least, pay the expense of an education.

Most parents have a laudable desire to leave some of this world's goods to their children. What better way could be devised than to plant a few apple trees for each one of them every year, and see that they have proper care. A little expenditure of this kind wisely made will soon grow into a handsome property.

We too often lose sight of the fact that the boy of to-day will be the man of to-morrow, and no one can over-estimate the importance of the influence brought to bear upon the youthful mind.

The farmer is quick to learn the effect of early training upon the horse, and knows full well that his future usefulness largely depends upon the treatment he receives the first few years. How much more important, then, should be the early instruction of a young mind capable of accomplishing so much of either good or evil in this world, and when done with this life is destined to enter upon another of endless duration.

However much agriculture be depressed in other parts of the world, the farmer of Maine who will make an intelligent use of his opportunities, has a bright future before him. If he will combine sheep husbandry or dairying with fruit culture and conduct his business with intelligence, system and energy, his bank account will constantly surprise him by its growth. There will be no need of over-work for himself, wife or children, and if in the treatment of his family he will ever bear in mind that after a few more shifting seasons, his boys will be men and he will enter his second childhood, he will find health and happiness in his household and have no fears that his children will desert the homestead.

What a grand opportunity we have to boom this State! If a few people would only take hold of the subject with the same faith and perseverance that the people of Sioux City did year after year with their corn palace, the State of Maine might double its agricultural wealth in a short time.

Every one here who has given any study to the subject at all, knows that there are untold possibilities in apple raising in the Pine Tree State. One hundred dollars wisely expended in setting apple trees, will, in a few years, become a thousand.

There are in the State nearly sixty-five thousand farms, averaging a little more than a hundred acres each. If there were set on an average during the next few years ten acres of the best apple trees to a farm and properly cared for, in fifteen years' time they would pay for all the cost and be worth two hundred dollars an acre, and the combined value would be more than all the farms of the State at the present time. The product of these trees would be greater than the yearly agricultural products of Maine. Over-production, exclaim some, but before fifteen years have expired the farmer will know nothing of over-production in any line of agriculture. We do not realize how fast the demand increases. As men grow wiser the consumption of fruit increases much faster than the population, and ere another decade is gone a large part of the money now paid for patent medicines, will be exchanged for berries, pears and apples. There will be twelve hundred thousand people more in the United States to eat the next apple crop than there were to eat the last, and in fifteen years' time we shall add to our population sixteen million fruit consumers, who with their increased wisdom in regard to diet, will do away with all fear of over-production.

CONDENSED FRUIT LIST.

The following condensed list of desirable varieties is substantially the same as published in previous years. As it is based on actual results in fruit growing in Maine, it will bear careful study on the part of those who are seeking information as to what varieties to set. Fruit growers are urged to report to the secretary on any other varieties that are especially deserving. If you know anything of the newest varieties, give the State the benefit of the information.

Those printed in *italics* are considered the best in quality and those followed by a star (*) are the most profitable.

To answer numerous inquiries we append descriptions of a few varieties of fruit. With one or two exceptions they are the newer varieties and not described in the standard works on fruits. We are indebted to Ellwanger & Barry for these descriptions which are copied almost entire from their general catalogue.

APPLES.

SUMMER—Duchess of Oldenburg, *Early Harvest*, Golden Sweet, *King Sweet*,* Large Yellow Bough (sweet), *Red Astrachan*,* *Russell*, *Tetofsky*, *William's Favorite*.*

AUTUMN—Alexander, *Deane*, *Fameuse*,* *Garden Royal*, Gloria Mundi, *Gravenstein*,* Montreal Peach, *Munson Sweet*, *Porter*, *Pound Sweet*,* Somerset, Wealthy.

WINTER—Baldwin,* Granite Beauty, Harvey Greening, *Hubbardston Nonsuch*, *Jewett's Fine Red*, *King Tompkins*,* *Milding*, *Rhode Island Greening*,* *Rolfe*, *Stark*, *Talman's Sweet*,* *Yellow Bellflower*, *American Golden Russet*.

For trial, McIntosh Red, Minister.

LATE WINTER—*Northern Spy*,* Roxbury Russet.*

During the past few years the Ben Davis has been one of the most profitable apples raised in the State. It "stands up" well in shipping, and is said to be improved by crossing the Atlantic. There are several other varieties that might be placed in the same list. The Society is unwilling to recommend them by placing them on the Condensed List, on account of their inferior quality. It is believed sooner or later, as better shipping facilities are provided for fruit, that it will not pay to send abroad any apples that are not among the best in quality.

AROOSTOOK COUNTY—From reports received there are several apples that thrive here, among which are Red Astrachan, Duchess of Oldenburg, Fameuse, Alexander, Wealthy, Yellow Transparent, Dudley, Montreal Peach.

DESCRIPTION OF VARIETIES.

RED BIETIGHEIMER—A rare and valuable German variety. Fruit large to very large; roundish, inclining to be conical; skin pale, cream-colored ground, mostly covered with purplish crimson; flesh white, firm, sub-acid, with a brisk, pleasant flavor. Tree a *free* grower and abundant bearer. This is one of the largest and handsomest apples. Early fall.

STUMP—Originated near Rochester. Fruit medium size, conical; skin yellow, striped and shaded with light red; resembles Chenango; flesh firm, crisp, juicy, tender, sprightly, sub-acid. Considered an acquisition to desirable market and garden varieties. Tree of handsome, stocky growth and prolific. September and October.

TETOVKA (Titus Apple)—Origin, Russian. Large; three and one-quarter to three and three-fourths inches in diameter; roundish, tapering slightly to crown; color, greenish yellow ground, striped and marbled with light red in the sun; when fully ripe, the ground is yellow, and the red deep and dark, mostly covering the fruit, and usually a light bloom; flesh rather coarse, tender, juicy, very mild acid; quality not high, but good. Tree a free grower and productive. Foliage very large. Ripe in September.

PEARS.

SUMMER — *Bartlett*,* Brandywine, *Clapp's Favorite*, Osband's Summer.

AUTUMN—Belle Lucrative, Beurre Superfine, Eastern Belle, Goodale, Louise Bonne de Jersey,* Nickerson, *Seckel*, *Sheldon*.

WINTER—*Beurre d'Anjou*,* Lawrence.

For trial, Josephene of Malines.

DESCRIPTION OF VARIETIES.

MARGARET (*Pelite Marguerite*)—Medium size; skin greenish yellow with brownish red cheek, and covered with greenish dots. Flesh fine, melting, juicy, vinous, and of first quality. Tree a vigorous, upright grower, and an early and abundant bearer. Succeeds as a standard or dwarf. The finest pear of its season. Ripens latter part of August.

FREDERICK CLAPP—Size above medium; form generally obovate; skin thin, smooth, clear lemon yellow; flesh fine grained, very juicy and melting; flavor sprightly, acidulous, rich and aromatic. Season, October 15th to November 1st. Tree a vigorous or free grower and somewhat spiny.

COL. WILDER—One of Fox's seedlings from California. Large, pyriform, oblong, inclining to oval; stalk set without depression; calyx very shallow, open or half open; skin yellow, profusely dotted and marbled with russet; flesh melting, full of juice, sweet; a delicious pear; keeps till March. A fair grower.

THE IDAHO PEAR—At the annual meeting of the British Columbia Fruit Growers' Association for 1891, Mr. George W. Beebe read a paper on this recent introduction. As yet not enough is known of the Idaho pear to pass judgment upon its merits, but many nuserymen are offering the tree to the public. So far as the tree has been tested in Maine it has proved to be perfectly hardy. From this paper the following is clipped:

Nearly a quarter of a century ago Mr. and Mrs. Mullkey, then residents of Portland, Oregon, concluded to try their luck in a new country. Amongst other things Mrs. Mullkey took with her four pear seeds that she had taken from a single species of pear, the name of the variety being unknown to her. So that the parentage is clouded in mystery. A spot of ground for the future home was selected on a piece of sage brush land, near the banks of the Clearwater river, in what was then known as the Territory of Idaho; here Mrs. Mullkey planted the four pear seeds she had taken with her, but one of the four seeds germinated, which grew nicely and in the short space of four years produced its first crop of fruit, and though the parentage of the Idaho is in doubt yet there is no doubt whatever regarding the foster parent, for the new variety immediately took upon itself the name of its guardian and was known as the Mullkey Pear. Some years later the Mullkey place passed into the hands of a Mr. Lindsay who is now the happy possessor, and with it went all interest in the Mullkey Pear, and for a time at least the name was changed and it was known as the Lindsay.

A few of the admirers of the then Lindsay Pear, in 1886, believing that there was a great future in store for this new attraction, concluded to organize what is now known as the Idaho Pear Company for the special purpose of distributing the stock. The company thinking that more than a local name would be desirable re-christened the Mullkey-Lindsay to the Idaho Pear.

While it is generally conceded that the Idaho is superior to the Bartlett in nearly every particular, yet it will hardly be a rival to that variety, as its season of ripening is nearly a month later; it will fill a place of its own. In size it will compare favorably with that standard, the Bartlett, and may be ranked as large, specimens having been grown exceeding a pound in weight. The shape is peculiarly its own, no pear approaching it except a pear of French origin known as the Crassane, and while there is some resemblance in this particular, yet Simon Bros., of Metz, and other authorities on pomological matters, who had tasted the Idaho, have stated that there is nothing in common between the two. In color it would be difficult to imagine a more beautiful fruit well ripened, being a golden yellow slightly tinged with red, not glaring in appearance, but of that peculiar blending of color that makes it especially attractive, but with its unusual attractions in color and size the flesh is firmer than the Bartlett, with a flavor, so far as my judgment goes, surpassing that of any other variety. The growth of the tree is very similar to the Bartlett, in fact, so much so, that I think it would be difficult to distinguish any difference between the two varieties. I noticed last spring that it was much later in coming into leaf than any other pear I have, and I have reason to believe from information obtained from other sources, that this is only another peculiar thing in its favor, as in some places where all the fruit buds have been killed on account of late frosts, the Idaho coming into leaf so much later has shown no sign of injury; in fact, Mr. Evans states that while the Bartlett and other pears were nearly all barren last year owing to late frosts, the Idaho had nearly a full crop of fruit.

PLUMS.

Bradshaw, Greely, *Green Gage*, Jefferson, Kingston, *Lombard*,* *McLaughlin*, Moore's Arctic, Niagara, Pond's Seedling, Prince's Imperial Gage, Purple Gage, Rivers' Blue Prolific, Shropshire Damson,* *Washington*, Yellow Egg.

DESCRIPTION OF VARIETY.

ORANGE—Large; skin bronze yellow, marked with roughish white dots, and clouded with purplish red; flesh deep yellow and juicy. Tree vigorous and productive. [Some of this variety has found its way into Maine as the Green Gage. It is easily distinguished by being yellower and later. It is by far the best plum for preserves and canning we have yet tried. D. H. K.]

CHERRIES.

Black Heart, Black Tartarian, *Common Native*, *Early Richmond*, Governor Wood, Mayduke, Ox Heart, Rockport.

THE SMALL FRUITS.

STRAWBERRIES—*Crescent*,* Downing, Kentucky, Manchester,* *Sharpless*, Wilson. The following are recommended for trial,—*Bubach*,* Pineapple, Ohio,* Belmont, Haverland,* Cloud.*

Those in *italics* are early, and those marked with a (*) are pistillate and require some of the perfect-flowered varieties set near them to pollenize the flowers.

DESCRIPTION OF VARIETY.

PARKER EARLE—A new berry, originating in Texas, and named in honor of a distinguished horticulturist; uniformly large, regular, conical with a short neck; color, glossy scarlet crimson; ripens all over; flesh moderately firm, no hollow core, quality good; flowers perfect, always setting perfect fruit. Plant very vigorous, healthy and remarkably productive. It is said to have yielded at the rate of 15,000 quarts to the acre. It is considered a very promising new variety. Season medium to late.

RASBBERRIES—*Red*—Cuthbert, Turner; *Yellow*—Golden Queen; *Black*—Gregg. Ada and Carmen are recommended for trial.

BLACKBERRIES—Snyder, Agawam, Bangor.

CURRANTS—*Red*—Fay's Prolific, Red Dutch, Victoria; *White*—White Grape; *Black*—Lee's Prolific.

GOOSEBERRIES—Downing, Houghton Seedling. Smith's Improved and Industry are recommended for trial.

GRAPES—Brighton, Champion, Delaware, Hartford Prolific, Lady, Moore's Early.

From T. S. Hubbard & Co.'s pamphlet "On Grape Vines and Small Fruits," we select the names of a few of the earliest grapes, and arrange them in the order of earliness; those printed in *italics* are regarded by them as the best in quality; the figures refer to hardiness of foliage and vines, the lowest numbers being the hardiest. Several published in their list are hardier but are later, hence none in the list are hardier than those marked "2."

Jessica (3), Champion (3), Dracut Amber (2), Moore's Early (2), Cottage (2), Lady (3), *Lindley* (4), Massasoit (4), Hartford (3), Hayes (3), Worden (2), *Brighton* (4), Wyoming Red (2), *Salem* (5), *Delaware* (3).

THE SECRETARY'S PORTFOLIO.

CONTAINING

Original and Selected Scraps, which, it is hoped, may be found helpful to Maine Fruit Growers.

Trees *themselves* are ours;
Fruits are born of flowers;
Beech, and roughest nut were blossoms in the spring;
The lusty bee knows well
The news, comes pell-mell,
And dances in the gloomy thicks with darksome antheming;
Beneath the very burden
Of planet-pressing ocean
We wash our smiling cheeks in peace—a thought for meek devotion.

LEIGH HUNT.

WINDOW-GARDEN DEPARTMENT.

A NEW WORK IN MAINE.

At a meeting of the executive committee held the day following our winter meeting in Cornish, the plan of window-gardening as outlined by the Secretary was approved and referred to President Pope and the Secretary for such action as they thought best. After correspondence with the committee of the Massachusetts Horticultural Society and interviews with various parties in Maine, it was decided to undertake such work in connection with our 1892 exhibition.

Under date of March 30, 1892, the following article appeared in the *Lewiston Journal*:

To the Editors of the Lewiston Journal:

At the annual winter meeting of the Maine State Pomological Society recently held in Cornish, the writer urged upon the society the importance of doing a broader educational wo k; that however much of recreation and traffic the agricultural fairs may afford, the only plea offered for their support is that in some way they are educational. There may be many things that cluster around the fair to amuse and entertain the crowd but in some way that will be beneficial to the public, the managers are in duty bound to make the fairs educational. And the public have a right to insist that this shall be done.

It has been the purpose of the officers of the Pomological Society to make this educational work broader in its exhibitions, so that all who visited the department might gain some knowledge of fruits and flowers. Nor has this been all; they have even attempted to make their hall attractive and pleasant. They have tried to have the exhibition kept in good order, and have even essayed to make it beautiful. That more has not been done is no fault of theirs, as the funds would not permit more in this direction.

A movement has been going on in the State for several years to introduce the study of agriculture in the public schools. The idea is a good one, and as the flora of the State is directly or indirectly the source from which nearly all the food of man or beast comes, the society offered premiums for correctly named collections of wild flowers made during the season. It is proposed this year to extend this work and invite the high schools of the State to compete, some premium being given to the school making the best collection of correctly named Maine flowers.

For several years the Massachusetts Horticultural Society has done an excellent work with the children of Boston through its efficient committee on window gardening. Potted plants are given to the children in the spring to be taken to their homes and cared for during the season, and in the autumn these plants were exhibited by the children, who were awarded small and suitable prizes. The plan at first was received with indifference and, but for the enthusiasm of a few friends, would have been defeated. The first season there was a general exhibition in Horticultural Hall, but the popularity of the work has necessitated the past few years several exhibitions in different parts of the city, the better to accommodate the large number of children who wished to take part in the exhibition.

By this plan many a child has learned to love plants and flowers by being taught to care for them, and many a desolate home has been made more pleasant by a plant or two in "training" for the exhibition.

The work of this committee has been still further extended, and special premiums under its direction, have been awarded for window gardens.

Although the Pomological Society has only limited means, the executive committee have decided to undertake a similar work in Lewiston and Auburn the present season, an equal number of plants being distributed to children twelve years of age or less. Superintendents Stuart and Stetson have kindly promised their co-operation in placing the plants in the best hands for the purpose. The children receiving the plants will be expected to care for them during the season and have them ready for exhibition at the park during the fair in September.

Each child who brings a plant for exhibition will receive a ticket admitting him or her to the fair on Children's Day. After the exhibition is over the plants will be returned to the children.

Prizes will be offered for the best plants and a committee will be chosen to examine the plants and make awards. Further details will be announced through the schools.

The society has only limited means with which to make a beginning in this work of interesting the children of Lewiston and Auburn in plants and flowers. But kind friends are offering assistance. President Pope writes that he will furnish one hundred coleus and fifty fuchsia plants. L. F. Abbott of the *Lewiston Journal* offers one hundred geraniums and ten yearly subscriptions to Vick's Magazine to be awarded as premiums.

Dr. George M. Twitchell, Secretary of the State Agricultural Society, gives $10 to be used in premiums. D. H. Knowlton & Co. will give twenty yearly subscriptions to one of their popular periodicals for premiums. The society will assume the care of the plants at the proper time and return them to some place designated for the purpose, furnish printed directions, and if necessary increase the number of plants. It is hoped other friends who would like to see more o this sort of work done in connection with the fairs will furnish more plants for this purpose, as well as to increase the premiums. It will be the effort of the officers to make faithful application of such funds and do all in their power to interest the children in the study of plant life.

Any contributions other friends may desire to make, either for plants or premiums may be sent to the Secretary at Farmington. All such will be acknowledged in the *Journal*.

D. H. KNOWLTON,

Secretary Maine State Pomological Society.

In the *Journal* in which this article was published there appeared the following editorial upon the subject:

CHILDREN AND FLOWERS.

"In another place will be found a communication from the secretary of the Maine State Pomological Society, regarding a new feature it is purposed to introduce, as an experiment into the work of the society. This feature of giving away plants to children of Lewiston and Auburn, to be trained and cared for by them and presented for exhibition and prizes next fall at the State Fair, is a new departure in the right direction. The project has the fullest sympathy of the *Journal*, which will extend a helping hand to further the object in every way.

"Through the love of the beautiful in both nature and art the individual is led to embrace higher ideals of those graces which adorn true manhood and womanhood. The cultivation and companionship of flowers brings the boy or girl who engages in the simplest form of floriculture, into touch with nature whose every form of loveliness in leaf or flower and distilling fragrance, breathes of purity and goodness.

"To President Pope and Secretary Knowlton are due, mainly, the fine arrangement in the floral displays which have hitherto graced the exhibition in the pomological department of the State Fair in years past. This new departure which Secretary Knowlton has presented, it is hoped will meet with such a response in the way of verbal encouragement at least, from the citizens of Lewiston and Auburn, whose boys and girls it will directly benefit, that such a spirit of emulation shall be engendered among the children, that our floral exhibition next September shall mark an era of progress in this, the poetry of gardening, hitherto unapproached."

Arrangements for the distribution of plants were perfected through the courtesy of Superintendents Stetson and Stuart, and June 7th the children received the plants, about 350 in all, each plant bearing the name of some child, a number and directions to preserve the tag and bring it and the plant to the place designated to receive them. The following circular was issued to the children receiving plants:

WINDOW-GARDEN DEPARTMENT.

At first the officers of the Society were very much in doubt about the possibility of accomplishing very much in a new department—an experiment in Maine at any rate. Friends kindly offered money, premiums and plants, and assurances came that the children of Lewiston and Auburn would just delight in taking part in this kind of work. They enjoy flowers, and if they can only have a chance, will show the people of Maine how they can grow plants for the Fair. The Trustees of the State Agricultural Society readily consented to furnish free tickets for Children's Day to those who bring plants.

There are three ideas in particular that have especially prevailed in undertaking this department: *First*, a larger number of plants on exhibition will make the hall more attractive and interesting to the public. *Second*, the Society is always ready to encourage the growing of flowers,—they are sources of unbounded pleasure to those who cultivate them. Should a few children be taught to care for plants and raise flowers, none can tell the pleasures in store for them. Again a little knowledge of plant life gained by the care of a few plants will lead to the study of others, and from these to the study and enjoyment of other objects in nature, up to the Great Source of Life. *Third*, a Children's Day at the Fair will certainly be a pleasure to some, and the officers will spare no pains to make the day pleasant to those who may visit this department at the Fair.

CARE OF THE PLANTS, ETC.

SOIL.—Many of the plants will need to be re-potted at once. The best soil for the purpose is a rich garden loam, to which add one-third well rotted stable manure, well mixed.

POTS.—The best are the common unglazed kind with saucers. Those that are painted or glazed are not desirable for flowering plants; when these are used extra care should be taken to secure good drainage from the bottom. Before filling the pots with soil a little charcoal and some broken bones will be found very acceptable to the plants, which will soon cover the bone with a net-work of tiny roots.

TREATMENT.—Plants are often injured by too frequent waterings. A safe rule is to apply water only when the surface is dry, and then put on enough to thoroughly moisten the soil. Some plants require more water than others, and the same plant at times will require more water than at other times. Sometimes they may need water every day; at other times several days may go by before the soil calls for more water. Careful attention is all that is required.

The leaves are the lungs of the plants, and it is necessary that the pores of the leaves be kept open if the plants are kept in healthy condition. In view of this, if the plants are kept in-doors or in dusty places out of doors, they should be washed frequently. A rubber sprinkler may be used for this, or a garden sprinkler; or if one does not have either, a whisk broom may be used. This sprinkling also keeps off the insects and makes the plants more hardy.

Have the pot clean, trim the plants often, take off all dead leaves and observe the other directions given, and you may be sure of beautiful window plants. The plant should stand up straight, the earth in the pot should be entirely free from weeds, and all stones and other unnecessary matter should be removed.

THE PLANT EXHIBITION.

On Monday, September 5th, the plants are to be delivered at some place which will be announced later. A team will be in readiness to take the plants to the Fair Grounds, and after the Fair, Saturday, the plants will be returned, and the owners should call for them that day. A free ticket to the Maine State Fair, Children's Day, will be furnished to every child who brings a plant properly tagged to the place announced Monday, September 5th.

It is expected that each child who receives a plant will take good care of it himself. Others may offer suggestions, but the child should care for the plant. It is also expected that every plant will be exhibited at the Fair.

The premiums to be awarded consist of $10 in cash contributed by Dr. Geo. M. Twitchell, Secretary of the State Agricultural Society; twelve annual subscriptions to Vick's *Floral Magazine*, contributed by Mr. L. F. Abbott, Agricultural Editor of the *Lewiston Journal;* and twenty annual subscriptions to the *School World* or *School-Days*, contributed by D. H. Knowlton & Co., Publishers, Farmington.

It is the hope of the officers of the Society that the children will enjoy the care of the plants, learn much of plant life, how they grow, what makes them grow. They also hope they will take so good care of the plants that they will be proud of their contribution to the success of our annual exhibition.

D. H. KNOWLTON, *Secretary*.

Farmington, Me., June 8, 1892.

We are indebted to the *Lewiston Journal* and *Auburn Gazette* for numerous notices of the work going on in this department. We are also indebted to the enthusiasm to Miss E. T. Simmons and her associate teachers in Auburn and to the Lewiston teachers for their co-operation in our window-garden department. The plants are now in the custody of the children and it remains to be seen how much will be accomplished this year. We are quite sure the children will try to do their part, and we have every reason to suppose the plan will prove a good one and meet with the approval of the public.

THE DISTRIBUTION OF THE PLANTS.

One of the prettiest scenes of the week was the distribution of plants to the little school children of Lewiston and Auburn.

This was in accordance with the published plan of the State Pomological Society, and the enthusiasm of the children, the joy with which they received them and the tender care they seemed to lavish on them were among the beautiful features of this thoughtfulness on the part of the society. Of course this is with a purpose, and that purpose is to instil into the children a love of window gardening. On the principle that, as the twig is bent the tree is inclined, none are given to children over ten or at most over twelve years of age, and they are to enter a competition to be decided at the State Fair, where all plants are to be returned and entered for show and prizes awarded. On a June day, the vision of hundreds of little folks bearing home plants to love and rear in tenderness, was a thing to remember.—*Lewiston Journal.*

MAINE'S WILD FLOWERS.

In order to encourage the study of wild flowers in the schools of the State, the following circular announcing the wild flower premiums offered by the society was mailed to the principals of the High Schools in the State:

To the High School Principals of Maine:

Your attention is most earnestly invited to the following premiums offered by our Society for individual and class work in botany the present season. The object of the Society in offering these premiums is to encourage the study of the natural sciences in the public schools of the State, more especially in their relation to agriculture. The members of your school are cordially invited to compete for these premiums. Will you not kindly use your influence in behalf of this object? Perhaps it ought to be added that what follows is taken from the Society's premium list for 1892, and that the competitors will be expected to exhibit specimens at the State Fair in Lewiston, in September next.

SPECIAL PRIZES.

		1st.	2d.	3d.
200	For the best exhibition of cut wild flowers in phials, each variety to have correct botanical and common names attached, not less than forty kinds....	$3	$2	

		1st	2d	3d.
201	For best exhibition of pressed wild flowers, collected in Maine during the season of 1892, each variety to have correct botanical and common names attached, not less than fifty kinds,	$4	$3	$1

FOR THE HIGH SCHOOLS IN MAINE.

202 For the best collection of correctly (botanically) named wild flowers, made during the season by any High School in Maine—a household microscope, suitable for school use.

For this premium entries must be made on or before September 1st with the Secretary, and the specimens must be in place on Tuesday, September 6th. In case the exhibitors cannot bring collections themselves, they may be sent to D. H. Knowlton, State Fair Grounds, Lewiston, at the Society's expense, and after the exhibition is over they will be packed and returned to parties sending them.

The specimens in this collection by individual pupils may also compete for premium No. 201. For mounting specimens note "Directions for Mounting," etc.

In awarding premium the committee will have regard to (1) correctness of names, (2) number of specimens and varieties, (3) general appearance of specimens and excellence of the work of the pupils.

It is not necessary that there should be more than one specimen of any species, though the collection as a whole should represent the work done by the school.

DIRECTIONS FOR MOUNTING SPECIMENS.

The specimens, so far as possible should show the whole plant and be carefully pressed before mounting. The specimens when dried may be kept in folded sheets of book paper; or they may be fastened by mucilage or slips of gummed paper to sheets one-half the size of the folded sheets, in which the specimens are loose. The sheets should be of uniform size—that recommended by Gray is 16½x10½ inches—the folded sheet, of course, being 16½x21. Two plants should not be attached to the same sheet. In the lower right-hand corner, either on the sheet, or on a slip pasted to the paper, write the botanical name, the date, the locality, etc., and the name of the collector. These directions apply with equal force to Nos. 201 and 202.

Address, D. H. Knowlton, *Secretary.*

Farmington, Me.

APPROVED VARIETIES OF STRAWBERRIES.

Mr. L. J. Farmer in an excellent paper on "Strawberries" presented to the Western N. Y. Horticultural Society the following data regarding varieties. They are too good to lose and we give them a place in the Secretary's Portfolio:

Soil, climate, mode of culture and other causes determine the value of a variety for any special location. Most varieties do best in the locality where they originate. A few seem to do well everywhere. Pistillates are usually more productive and hardy than hermaphrodites, but not always so. Varieties that produce lots of runners do best on sandy or porous soil. When planted on clay they run too much to vines and produce only small inferior fruits. Varieties of slow growth like Sharpless, Bubach and Wilson, that make large plants and few of them, do best on a soil made up largely of clay. Most varieties do best in a moist season but Haverland, Parker Earle and a few others seem to prefer a dry season. There are varieties that will stand almost any amount of fertility and produce correspondingly large crops. Other varieties require only a moderate amount of fertility and run to vines if too highly enriched. This only goes to prove that in order to be always sure of a crop, we must grow several varieties. Before accepting the advice of anyone as to which is the best variety to plant, the grower should first see that the conditions are the same. For instance, our soil is a stony loam while the soil at the Geneva, N. Y. Station, is a tenacious clay loam. Varieties that are a success with us are often a failure at the Station and vice versa. No one can accurately decide as to the merits of a variety from one year's test. It takes at least two different seasons and often more.

The six best varieties among those that have been thoroughly tested at our place are Warfield, Haverland, Michel's Early for early, and Eureka, Parker Earle, and Burt for late. These six meet all wants with us.

Warfield resembled Crescent in growth and Wilson in fruit. The berries are of a dark color, very glossy, and sell up with the largest varieties on account of their beautiful color and firmness. The plants are very small when young, but have great vitality and by fall cover the surface. This variety with a proper fertilizer takes the place of both Wilson and Crescent.

Haverland endures the drouth better than any other variety we grow; but in a wet season the fruit is all water and won't stand shipment. In a dry season like the last one, this berry will pay best of all on account of its great productiveness, size and fine appearance. It ripens early and continues until very late.

Michel's Early ripens first of all. It is valuable on account of its extreme earliness and as a pollenizer for early pistillates like Warfield and Haverland. It is very productive of berries the size of Crescent; but towards the close of the season they appeared as if rolled in road dust. Whether a trait of the variety or caused by drouth we do not know.

Eureka is the best late market strawberry. It begins to ripen as the early varieties begin to fail and continues until all others are gone. The berries are extra large, firm and of a bright glossy crimson, the ideal strawberry color. Plants are good size, very vigorous and productive. For fertilizing this use Burt or Parker Earle.

Burt is an ironclad in every respect. We have recommended it as the best variety for wet soils and wet seasons, but the last year's experience proves it one of the best for dry seasons. Berries are fair size, round and very firm. Even after long continued rains they carry well to market. It lacks flavor, however, and should not be grown for fancy tastes.

Parker Earle should have more admirers among those that are well posted on varieties than any other variety. No one can see a row of this variety in fruiting without falling in love with them. The berries are rather long and slim, appearing as if the end had been cut off. The way they are crowded around the plant reminds one of that expression used by introducers of new strawberries, "They lay around the plants in heaps and piles." The berries turn white before coloring red and when ripe are very beautiful, covered with golden seeds. It is not as firm, large or attractive as Eureka and therefore will not equal it for market; but were I asked to name the best one variety for home use, I should unhesitatingly name Parker Earle.

SULPHURING IN FRUIT DRYING.

Sulphurous gas, which is formed when sulphur is burned, is well known, and constantly used as a disinfecting, bleaching and deodorizing agent, second in virtue only to chlorine. The fact that it is the agent officially used in the disinfection of infected houses, ships and individuals is conclusive on these points. It is, therefore, idle to pretend that sulphuring does not diminish the flavor of fruit or of anything else touched by it. It is perfectly certain that it does so; and the only debatable question is the extent to which it may be used for bleaching fruit without any material detriment to the flavor.

It is in evidence that a reasonable amount of bleaching can be done by applying the gas to the freshly cut fruit without injuring the flavor to a material degree, since the flavor will penetrate from the inside outward to a sufficient extent to compensate for the loss of what naturally belongs to the bleached exterior portion.

The limit, however, is a narrow one, and it is so frequently exceeded in practice (whether intentionally to secure "extra light" color to attract the unwary purchaser or, more commonly, by unskillful or negligent workmen in charge of the sulphuring boxes) as to put upon the market a good deal of fruit that is the reverse of creditable to the State that produces it, and ill calculated to insure a permanent demand. This is especially true of the thinly sliced apples and pears, which are quickly penetrated by the gas and assume a greenish-white tint that, while it may be inviting to equally "green" purchasers, assures the expert that the natural flavor is practically gone. The producer himself declines to put them on his table, but the dealer and the public, as at present informed, are willing to pay an extra price for it. This demand for unnaturally light-colored dried fruit is a "fad" like many others, which will have its day but will inevitably give way, in the course of time, to a preference for the better flavored product having the tint which insures its being so. So long as the "fad" lasts, so long will producers or dealers sulphur the fruit to suit the eye rather than the palate of the consumer. It certainly seems desirable to hasten the advent of a more rational state of the public mind on this point; quite apart from the sanitary consideration, which, if not of primary importance as regards most of the sulphured fruit now in the market, has nevertheless proved sufficiently potent to cause the practice of sulphuring to be legally prohibited in the old world, where therefore our fruits so treated would fall under the ban of the law. An additional consideration is that this process permits of rendering third and fourth class fruit equal in appearance to the best, and is therefore easily used for fraudulent purposes.

There thus seems to me to be abundant cause for desiring, and working for, the abatement of the public delusion on the subject of light-colored dried fruit, which sacrifices the substance to the shadow and is certain in the end, to inure to the detriment of our dried-fruit trade.

I hope to find a measurably unobjectionable substitute for the uncertain process as now practiced, in the use of a solution of "bisulphite of soda" (heretofore sold under the name of "California fruit salt") of definite strength, into which the cut fruit can be dipped before drying. In this process, the same agent (sulphurous gas) is employed in the liquid form, but so controlled as to the amount used that the chances of overdoing the sulphuring—now so great because of the convenience with which the fruit can be left exposed to the sulphurous gas for an indefinite time—would be reduced to a minimum. The compound can be produced very cheaply, and the solution used will be very weak.

The exact strength and time required to produce the best results with different fruits will form the subject of experiments at the station during the coming fruit season.

E. W. HILGARD.

Director Agricultural Experiment Station, Berkeley, Cal.

FERTILIZERS FOR FRUITS.

An average apple crop of 300 bushels per acre, with the new growth of wood, will take from the soil fourteen p unds of potash and eighty pounds of phosphoric acid per year. Years of study and experiment persuade me that not less than an annual appl cation per acre of twenty-five pounds of potash with some lime and magnesia is absolutely demanded. The relative proportions of these substances need not vary for other fruits. To meet my demands I have evolved the following formula:

Cotton seed meal	200	pounds.
Muriate of potash	140	"
Nitrate of soda	60	"
Sulphate of ammonia	40	"
Sulphate of magnesia	40	"
South Carolina fine ground rock (floats)	70	"
Plaster	70	"
Total	620	"

The net cost of these materials at my railroad station last season was $11 per ton.

—*E. Williams, before N. J. State Horticultural Society.*

SPARE THE BIRDS.

First and foremost of the orchard and garden helpers is the purple martin. It is the general impression that this bird takes insects only on the wing, but it does more than this. I saw numbers of them the past summer, taking the rose bug from the grape vine. They swooped down and picked them off without alighting. They circled around in companies, back again to this same vine, each one snatching off a bug as they passed. Put up boxes for the martins and see that the English sparrow does not get possession.

The oriole is another great helper. It knows how to pull the bag worm from its case and does it systematically and rapidly. The tent caterpillar and fall web worm it also has a liking for; it ruthlessly tears the tents and web to pieces and destroys untold numbers. Allow no gunner to shoot one of these beautiful, gaily dressed birds on your premises, not even if the lady of your choice is pining for the skeleton to perch on her hat.

The cat-bird and the red-eyed vireo, both eat the unsavory pear slug. But it is not necessary to mention the good service rendered by our more common birds, such as the robin, brown-thrush, blue-bird, and wren, as all have seen their good works.

Horticulturists are aware of the good that they do. Our winter birds are also showing good work. The seed eating ones, pick up great quantities of seeds of noxious weeds, while our woodpeckers, jays, and chickadees are constantly on the lookout for hibernating insects. Spare and encourage the birds, both winter and summer, about homes, grounds and fields.

Longfellow says:

> You call them thieves and pillagers; but know
> They are the winged wardens of your farms,
> Who from the corn-fields drive the insidious foe,
> And from your harvests keep a hundred harms;
> Even the blackest of them all, the crow,
> Renders good service as your man at arms,
> Crushing the beetle in his coat of mail,
> And crying havoc on the slug and snail.

—*Mrs. Mary Treat, before N. J. State Horticultural Society.*

MILDEW ON GOOSEBERRY.

Powdery mildew of the gooseberry affects most largely the large English varieties. The fruit is discolored as well as the leaves destroyed in some cases; but in many localities these English gooseberries are grown without any signs of the disease. They are large and superior in quality and can be successfully grown where the mildew does affect them, providing the proper remedy is used, which is the sulphide of potassium in solution. It does no injury, not being poisonous in the small quantity applied. One gallon is applied to ten or twelve bushes, costing one cent per bush. Spray as soon as the leaves unfold; after this spray after each rain.—*Prof. S. A. Beach.*

CRYSTALLIZING FRUIT.

Though no authority on crystallizing fruit—that is, professionally—there is a simple process for home crystallizing which I know of. The fruit is dried first. For this the finest fruit is selected. It must be very ripe, then thoroughly dried, and after this "sweated." Then it is dipped in the very heaviest syrup one can make—say that used for candied fruit, which is a gill of water to a pound of sugar. I can give no exact rule for time of dipping—two or three minutes in the hot syrup. Then the fruit is dried again. This process makes a delicious article, and for this reason: The dried fruit, without sugar, retains all the fruity flavor, and the dipping process after the drying does not penetrate the fruit so as to destroy that fine, natural flavor, but merely adds to it the taste of the sugar crystals which are formed on the surface. It is unnecessary to say that the very best granulated sugar should be used. I might add that some confound crystallized fruit with sweetmeats or candied fruit. As I understand the matter the difference between them is this: For the former the fruit is dipped in the syrup after being dried, not cooked in it; while for the latter the fruit is cooked slowly and carefully in the heavy syrup and then dried.—*Good Housekeeping.*

APPETIZING WAYS IN WHICH APPLES MAY BE SERVED.

To make apple float take a tablespoonful of red apple or crab-apple jelly to each white of egg, and whisk until the mixture is quite light and foamy. Pour a plain custard into a deep glass dish and pile the mixture over it. Serve with sponge rusk fingers.

For ginger apples, take some hard, smooth skinned apples and cut them into quarters. To every pound of apples allow a quarter of a pint of water and half a pound of sugar. Boil the water and sugar together until they become a thick syrup, then pour this over the apples, allowing them to stand for twenty-four hours. Then add the same quantity of sugar as used for the syrup, and to every pound of the fruit half an ounce of bruised ginger and a pinch of cayenne pepper tied up in muslin. Let this simmer until the fruit is transparent, and put into jars, covering as tightly as possible. The ginger and muslin should be carefully removed.

For apple snow-balls, boil one-quarter pound of rice in water until perfectly tender. Pare and core a few apples, replace the core by two cloves, brown sugar and a squeeze of lemon juice. Cover each apple with a little rice and tie up separately in a cloth. Boil for half an hour, and serve with a sweet sauce flavored with lemon.

Pare half a dozen good apples for apple compote, scoop out the middle without breaking the fruit. Place in a pie dish with a quarter of a pint of water, half a pound of sugar, and the rind and juice of half a lemon. Cover the dish and cook in a hot oven until the fruit is quite tender.

To prepare pink apple snow, pare, core and boil six large apples to a pulp, and press them through a sieve. Sweeten to taste, and then to every tablespoonful of apple add a teaspoonful of currant jelly. Whisk the whites of six or seven eggs with two heaped tablespoonfuls of sugar, and when frothing add them to the apple mixture, whisking all together until quite light. Pile high on a glass dish and add a currant or strawberry jelly garniture. This dish is one very suitable for children and invalids. For fried apples, slice some apples, dip them in a batter made of one egg, sugar, milk and flour enough to thicken. Fry a golden brown, sprinkle with lemon juice, and serve very hot.

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LAWS OF MAINE

RELATING TO

AGRICULTURE.

From the Office of the

STATE BOARD OF AGRICULTURE,

AUGUSTA, MAINE,

1892.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1892.

CHAPTERS OF REVISED STATUTES AND PORTIONS OF SAME RELATING ESPECIALLY TO AGRICULTURE AND KINDRED TOPICS.

Chapter 58 Revised Statutes.

SECT. 1. The Maine Board of Agriculture for the improvement of agriculture and the advancement of the general interests of husbandry, consists of the president and the professor of agriculture of the State College of Agriculture and the Mechanic Arts, together with one person from each county elected by ballot by any county agricultural or horticultural society at its annual, or other meeting called for the purpose; and they hold their offices for three years from the third Wednesday of January thereafter.

SECT. 2. (As amended in 1891, chapter 94.) If there is more than one such society in a county the executive officers of the oldest shall designate a time and place for a convention of five delegates, chosen from each society at a regular meeting; and the secretary of such oldest society shall give written notice thereof to the secretary of each of the others. The convention shall be held prior to the third Wednesday of January and shall elect a president and secretary and by ballot, a member of the board of agriculture for that county. If no election is made, the secretary shall immediately send to the governor and council the names of two or more persons having the highest number of votes; and they shall elect one of them. Vacancies in counties, however caused, shall be filled within three months after notice to the secretary of the oldest society in the county where such vacancy exists; if there is more than one at a special meeting, in the same manner as is hereinbefore provided for the election of county members of said board. The written certificate of the secretary of the society or convention electing a member, shall be his credentials in the board.

SECT. 3. (As amended 1891, chapter 18, section 1.) The board shall hold a business session at the capital, annually, commencing on the third Wednesday of January, for the election of officers and perfecting of plans for the execution of the work for the year.

SECT. 4. (As amended 1891, chapter 18, section 2.) 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, and it may issue bulletins, employ experts, lecturers, a reporter, or other aids to enhance the usefulness of said institutes to the public; and shall, so far as practicable, aid and encourage agricultural societies and associations in their efforts. The members shall receive no compensation for time and services, but shall be reimbursed for expenses incurred in the discharge of their duties, two dollars a day for subsistence and six cents a mile for travel. The whole expenses under this section shall not exceed three thousand dollars annually.

SECT. 5. (As amended 1887, chapter 125.) The board shall appoint a secretary, as its chief executive officer, for a term of three years and until his successor is appointed, and may prescribe his duties, a part of which shall be by personal observation, investigation, and correspondence, to acquaint himself, with the methods and wants of practical husbandry, the means of fertilization, and the adaptation of various products to the soils and climate of Maine; also with the progress of scientific and practical agriculture elsewhere, with a view to the more complete development of the natural resources of the State. He shall, annually, by the third Wednesday in January, present to the governor and council a report of the doings of the board and the results of his own labors and investigations, together with useful communications, suggestions and recommendations. Twelve thousand copies of said report shall be printed, all bound in cloth, one half of each for the legislature, and the remainder after reserving a suitable number for foreign exchanges, for distribution under the direction of the board, among the agricultural institutions and the people of the state.

SECT. 6. (Repealed 1889, chapter 295.)

SECT. 7. The board shall investigate such subjects relating to agriculture, horticulture, and the arts connected therewith, as they think proper, and may take and hold in trust, gifts or bequests made to it for promoting agricultural education, or the general interest of husbandry.

STATE AGRICULTURAL SOCIETY.

SECT. 8. The Maine State Agricultural Society, at its annual meeting, shall elect, by ballot, a president, secretary, treasurer, trustees and other necessary officers.

SECT. 9. Said society may take and hold property, real and personal, the annual income of which shall not exceed five thousand dollars, to be applied exclusively to the advancement of agriculture, horticulture, and the arts connected therewith; and the treasurer of said society shall give a suitable bond to the board of trustees, for the safe keeping of said property, and for the faithful discharge of his duties. At each annual meeting, the treasurer shall submit a full and correct account of the money received and expended; and the secretary shall make a report of the doings of the society, with such information and suggestions as he deems useful to the public.

COUNTY AND LOCAL AGRICULTURAL SOCIETIES.

SECT. 10. County and local agricultural societies may take and hold property, real and personal, the income of which shall not exceed three thousand dollars, to be applied to the purposes provided in their charters; or their treasurers may receive conveyances or leases of such property, for their societies, and hold, sell, mortgage or pledge it, and shall give bonds to the trustees for the safe keeping thereof and the faithful discharge of their duties.

SECT 11. (As amended 1889, chapter 186, and 1891 chapter 135 P. and S.)

There shall be appropriated annually from the state treasury, a sum of money not exceeding one cent to each inhabitant of the state, which shall be divided among the legally incorporated agricultural societies of the state, not provided for by special enactment, according to the amount of premiums and gratuities awarded by said societies; provided, that no society shall receive from the state a sum greater than that actually raised and paid by the society for said purposes. But the Penobscot and Aroostook Union Agricultural Society may annually receive as much as is raised by it not exceeding one hundred dollars without regard to population, and the Waldo and Penobscot Agricultural Society, as much as is raised by it not exceeding two hundred and fifty dollars, and the Ossipee Valley Union Agricultural Society, not exceeding two hundred dollars.

SECT. 12. None of such payments shall be made to any society until the treasurer thereof files with the treasurer of state a certificate, on oath, stating the amount raised by it and containing the specifications required in section fourteen, and also a certificate from the secretary of the board of agriculture that said society has complied with the requirements of section fifteen.

SECT. 13. Every society receiving the bounty of the state, shall expend an equal amount each year in premiums and gratuities for the improvement and encouragement of agriculture, horticulture, or the mechanic arts, unless the board of agriculture directs for what purposes a sum not exceeding half of such bounty shall be expended; and then it shall be expended accordingly.

SECT. 14. Every society applying for the bounty of the state, shall require of all competitors for premiums either on animals, crops, dairy products, or improvements of soils or manures, a full and accurate statement of the method of rearing, managing, producing and accomplishing the same, together with its cost and value, with a view of showing the profits or benefits derived or expected therefrom; and the application for bounty shall embrace all the specifications included in the following form, to wit:

"I, A. B., treasurer of the —— society, hereby apply for bounty in aid of said society, as granted by law, and being sworn, '(or affirmed)' say that $—.— has been raised and paid in good faith into the treasury of said society, and that $—.— has been awarded in premiums or otherwise expended within the past year, in conformity with law."

SECT. 15. The secretaries of the several societies shall prepare an annual report embracing a concise statement of the financial condition and doings of the society, with a synopsis of the premiums awarded, to be made by filling blanks furnished by the secretary of said board. Said report shall also state the leading features of the annual exhibition, the character of the efforts of the society for the advancement of agriculture, the principal crops raised in the county or district, the success attending their culture as compared with former years, and the obstacles met with; and generally the condition, prospects and wants of agriculture; which report, with a list of the officers of the society and the post office address of each, renewed at each new election, and all statements made by successful competitors for premiums, and any reports of committees, essays, addresses or other papers presented to the society containing matters of general interest, shall be returned to the secretary of the board by the first Wednesday of each December. Upon receipt and after examinations of said returns, if the secretary of the board finds them full, faithful and accurate, according to the intent thereof, he shall issue the certificate mentioned in section twelve, and not otherwise.

SECT. 16. All incorporated agricultural societies may, by their officers, define and fix bounds of sufficient extent for the erection of their cattle pens and yards, and for convenient passage ways to and about the same, on the days of their cattle shows and exhibitions, and for their plowing matches and trials of working teams, within which no person shall enter or pass, unless in conformity with the regulations of the officers thereof; but they shall not so occupy or include the lands of any person without his consent, or obstruct the public travel of any highway.

SECT. 17. Whoever, contrary to such regulations and after notice thereof, enters or passes within the bounds so fixed, forfeits to such society not exceeding five dollars, to be recovered on complaint.

SECT. 18. The officers of any such society may appoint a sufficient number of suitable persons, to act as constables at cattle shows and exhibitions, with all the powers of constables, for the preservation of the public peace, and the enforcement of the regulations of said society, within the towns where such shows and exhibitions are held, from noon of the day preceding the commencement of the same until noon of the day succeeding the termination thereof, and no longer.

SECT. 19. Whoever sells any refreshments, or other merchandise, or exhibits any show or play, within a quarter of a mile of the fair grounds of any agricultural society, during the time of any exhibition thereof, unless in his own dwelling-house, or usual and ordinary place of business or lets any land or building adjoining, or overlooking the fair grounds of such society, to spectators of any exhibition thereof, during the time of such exhibition, without the written consent of its trustees, forfeits to such society not exceeding one hundred dollars, to be recovered on complaint of two of its trustees.

REVISED STATUTES, CHAPTER ONE HUNDRED FIFTEEN, SECTION ONE, RELATING TO SALARY OF SECRETARY BOARD OF AGRICULTURE, AMENDED 1891.

SECT. 1. The secretary of the board of agriculture, fifteen hundred dollars, and reimbursement for necessary expenses incurred in the discharge of his duties, an account whereof shall be first audited by the governor and council, who from time to time may draw their warrants on the treasurer of state for such sums as are necessary to defray the same and other expenses provided for in chapter fifty-eight.

PUBLIC LAWS 1891, CHAPTER SEVENTY, AN ACT IN RELATION TO AGRICULTURAL FAIRS TO PREVENT FRAUDS.

SECT. 1. Whoever makes entries of animals or articles as competitors for premiums or purses offered by any agricultural society or by any person or association in this state, shall be holden to pay the entry fee in accordance with the advertised rules and regulations of any such society, person or association, not in conflict with the laws of this state; and a lien is hereby created upon such animals and articles for such entry fee to secure payment thereof with costs, to be enforced by an action of debt against the person owning such animals or articles, or the person entering the same; the same to be enforced in the same manner as liens on goods in possession and choses in action, but such lien shall not affect the title of any innocent purchaser of said animals or articles without actual notice of such lien.

SECT. 2. Whoever, for the purpose of competing for purses or premiums, knowingly and designedly enters or drives any horse that shall have been painted or disguised, or that represents any other or different horse from the one which is purported to be entered, or shall knowingly and designedly, for the purpose of competing for premiums or purses, enter or drive a horse in a class to which it does not properly belong, shall be deemed guilty of cheating by false pretences, and shall be punished by a fine not exceeding five hundred dollars, or by imprisonment not exceeding six months, and such horse, after such notice to the owner as the court may order and a hearing thereon, may be forfeited in the discretion of the court and sold, one-half of the net proceeds of such sale shall go to the informant and the other half to the county in which the offense is committed. The pecuniary penalty shall be enforced by indictment and the forfeiture by a libel filed by the informant and proceedings in the manner provided in chapter ninety-eight, Revised Statutes.

SECT. 3. Agricultural societies, persons and associations holding public fairs for competition for premiums or purses, are authorized to conduct and manage the exhibitions in accordance with the advertised rules and regulations, not in conflict with the laws of the state. Approved March 17, 1891.

INSPECTION AND SALE OF AGRICULTURAL PRODUCTIONS, BOUNTIES, MARKING OF SHEEP AND HORSE RECORDS.

Chapter 38.

Milk.

SECT. 44. The municipal officers of towns containing not less than three thousand inhabitants shall, on application of ten voters therein, annually appoint one or more persons to be inspectors of milk, who shall, before entering upon their duties, be sworn, and give notice of their appointment by publishing the same for two weeks in a newspaper published in their towns, if any, otherwise by posting such notice in two or more public places therein.

SECT. 45. Inspectors shall keep an office and books for the purpose of recording the names and places of business of all persons selling milk within their limits. They may enter any place where milk is kept or stored for sale, and examine all carriages used in the conveyance thereof, and when they have reason to believe any milk found therein to be adulterated, they shall take specimens thereof, and cause them to be analyzed or otherwise satisfactorily tested, and they shall preserve the result as evidence, and prosecute for all violations of the two following sections.

SECT. 46. (Amended 1887, chapter 20.) All measures, cans or other vessels used in the sale of milk, shall annually be sealed by the sealer of weights and measures, by wine measure, and shall be marked by the sealer with figures, indicating the quantity which they hold, and whoever fraudulantly sells by any other measure, can or vessel forfeits twenty dollars for each offense.

SECT. 47. Whoever acting for himself or as the employe of another, knowingly or willfully sells or offers for sale, milk from cows diseased, sick, or fed upon the refuse of breweries or distilleries, or upon any substance deleterious to its quality, or milk to which water or any foreign substance has been added, forfeits twenty dollars for the first, fifty dollars for every subsequent offense; to be recovered for the town where the offense is committed, by complaint or indictment.

AN ACT TO REGULATE THE SALE AND ANALYSIS OF COMMERCIAL FERTILIZERS. PASSED 1889, TAKING THE PLACE OF SECTIONS 48 to 54 INCLUSIVE, REVISED STATUTES.

SECT. 1. The manufacturer, company, or person selling or offering for sale in this state, any commercial fertilizers exceeding ten dollars per ton in price shall, on or before the first day of March, annually, or before offering the same for sale, register in the office of the department of the Maine State College of Agriculture and the Mechanic Arts, known as the Agricultural Experiment Station, the name or trade-mark under which the fertilizer is sold, the name of the manufacturer, and the place of manufacture.

SECT. 2. Any manufacturer, company, or person who shall offer, sell, or expose for sale in this state, any commercial fertilizer, the price of which exceeds ten dollars per ton, shall affix to every package, in a conspicuous place on the outside thereof, a plainly printed certificate, stating 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, and the place of manufacture, 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 or reverted, as well as the total phosphoric acid.

SECT. 3. Any representative or agent of said station, is hereby empowered to select from three different parcels or packages of commercial fertilizers, taken from three different sections of the state, held or offered for sale in this state, quantities not exceeding two pounds from each package, which quantities shall be for analysis and the average of the several analyses shall be taken to compare with the certificate found on the given packages held or offered for sale; and said station may cause to be selected each year, at least three samples, as aforesaid, from each brand held for sale. The agent shall select these samples in the presence of some representative of the company, from which the quantities are so selected, and shall deliver one-half of said samples, properly sealed by him, to said representative.

SECT. 4. Any person or party who shall offer or expose for sale any commercial fertilizer, without complying with the requirements of sections one and two of this act, shall be fined not less than twenty-five dollars nor more than one hundred dollars for the first offense, and not less than one hundred dollars nor more than three hundred dollars for each subsequent offense.

SECT. 5. This act shall take effect October one, eighteen hundred and eighty-seven.

SECT. 6. All acts or parts of acts inconsistent with this act, are hereby repealed.

'Section 55. As amended 1889, chapter 174. All hay pressed and put up in bundles, except hay pressed by farmers and retailed from their own barns, shall have the first letter of their christian, and the whole of the surname of the person putting up the same, written, printed or stamped on bands or boards made fast thereto, with the name of the state and the place where such person lives. Whoever offers for sale or shipment any pressed hay not marked as aforesaid, except hay pressed by farmers and retailed from their own barns, forfeits one dollar for each bale so offered, to be recovered by complaint.'

MEASURES OF SALT, CORN AND GRAIN.

SECT. 56. The municipal officers of towns may annually appoint measurers of salt, corn and grain therein, who shall be sworn, and receive such fees from the purchaser as said officers establish; and in every contract made in the state for the sale of salt by the hogshead, such hogshead shall consist of eight bushels; and when the buyer or seller requests, salt, corn, or grain in places where such measurers live, shall be measured by them.

WEIGHT OF CORN AND GRAIN, MEAL, VEGETABLES AND HAIR.

SECT. 57. The standard of a bushel of potatoes, in good order and fit for shipping, is sixty pounds; of apples, in good order and fit for the market, forty-four pounds; of wheat, sixty pounds; of corn, fifty-six pounds; of barley and buckwheat, forty-eight pounds; of carrots, fifty pounds; of onions in good order and fit for shipping, fifty-two pounds; of ruta-baga, sugar beets, mangel wurzel, and turnip beets, in like condition, sixty pounds; of English turnips, in like condition, fifty pounds; of beans sixty-two pounds; of peas sixty pounds; of rye and Indian meal, fifty pounds; of oats, thirty-two pounds; of Turks Island, or other course grades of salt, seventy pounds, and of Liverpool, or other fine grades, sixty pounds; and of hair used in masonry, well dried and cleansed, eleven pounds; and the measure of each of these articles shall be determined as aforesaid at the request of the vender or vendee; and if either party refuses so to do, he forfeits twenty cents for each bushel, to the person prosecuting therefor within thirty days.

So much of the above section as applies to the weight of a bushel of oats was amended in 1887.

BOUNTY ON SILK.

SECT. 58. Treasurers of towns, on satisfactory proof, shall pay a bounty of ten cents for every pound of cocoons, and one dollar for every pound of silk reeled from cocoons, raised in the state, to the person raising it in such town; such applicant shall make oath, that no bounty has been received by any person for such cocoons or silk; and each treasurer shall keep an account of the money so paid, and present it verified by his oath, to the next legislature, and if found correct, it shall be allowed and paid from the state treasury.

BOUNTY ON BEET SUGAR.

SECT. 59. The governor and council may, on such terms and conditions as they deem advantageous to the state, contract with any responsible party or company, to pay said party or company not exceeding one cent a pound, on all beet sugar manufactured in the state, from beets raised in the state; but the bounty, so paid, shall not exceed seven thousand dollars in any one year, and shall not exceed ten years from the time of the payment of the first bounty money.

MARKING SHEEP.

SECT. 60. All owners of sheep shall mark them with some distinctive mark, by a cut in ears, or a brand on some part of the animal, and cause such mark to be recorded by the clerk of their town in a book kept for that purpose, paying the clerk eight cents therefor.

AN ACT TO AMEND SECTION SIXTY-ONE OF CHAPTER THIRTY-EIGHT OF THE REVISED STATUTES, RELATING TO RECORD OF STALLIONS.

'Section 61. As amended 1889, chapter 161. The owner or keeper of any stallion for breeding purposes before advertising, by written or printed notices, the service thereof, shall file a certificate with the register of deeds in the county where said stallion is owned, or kept, stating the name, color, age and size of the same, together with the pedigree of said stallion, as fully as attainable, and the name of the person by whom he was bred. And it shall be the duty of such register to record such certificate in a book kept for that purpose; copies of such certificate, duly certified by such register, may be used in evidence, the same as the original, in any court in this state. The fee of the register for recording, and for each certificate, shall be twenty-five cents. Whoever neglects to make and file such certificate shall recover no compensation for said services, and if he knowingly and willfully makes and files a false certificate of the statements aforesaid, he forfeits one hundred dollars, to be recovered by complaint, indictment or action of debt, for the county where the offense is committed.'

AN ACT AS AMENDED 1889 TO EXTIRPATE CONTAGIOUS DISEASES AMONG CATTLE.

Chapter 177.

SECT. 1. That for the purpose of facilitating and encouraging the live stock interests of the state of Maine, and for extirpating all insidious, infectious and contagious diseases, now or that may be among cattle and other live stock, and especially tuberculosis, the governor of the state is hereby authorized and required, immediately after the passage of this act, to appoint a board of cattle commissioners consisting of three persons of known executive ability, who shall be charged with the execution of the provisions of this act, and who shall be known and designated as the State of Maine Cattle Commission, and whose powers and duties shall be those provided for in this act, and whose tenure of office shall be at the option of the governor. The compensation of said commissioners shall be at the rate of three dollars per day during the time they are actually engaged in the discharge of their duties as commissioners. The said commissioners shall respectively take an oath to faithfully perform the duties of their office, and shall immediately organize as such commission by the election of one of their number as president thereof, and proceed forthwith to the discharge of the duties devolved upon them by the provisions of this act.

SECT. 2. That it shall be the duties of the said commissioners to cause investigation to be made as to the existence of tuberculosis, pleuro-pneumonia, foot and mouth disease, and any other infectious or contagious diseases. And such commissioners or their duly constituted agent are hereby authorized to enter any premises or places, including stock yards, cars and vessels within any county or part of the state in or at which they have reason to believe there exists any such diseases, and to make search, investigation and inquiry, in regard to the existence thereof. Upon the discovery of the existence of any of the said diseases, the said commissioners are hereby authorized to give notice, by publication, of the existence of such disease, and the locality thereof, in such newspapers as they may select, and to notify in writing, the officials or agents of any railroad, steamboat, or other transportation company, doing business in or through such infected locality, of the existence of such disease; and are hereby authorized and required to establish and maintain such quarantine of animals, places, premises or localities, as they may deem necessary to prevent the spread of any such disease, and also to cause the appraisal of the animal or animals affected with the said disease, in accordance with such rules and regulations by them, as hereinafter authorized and provided, and also to cause the same to be destroyed, and to pay the owner or owners thereof one-half of their value, as determined upon the basis of health before infection, out of any moneys appropriated by the legislature for that purpose; provided, however, that no appraised value shall be more than two hundred dollars for an animal with pedigree recorded or recordable in the recognized herd-books of the breed in which the animal destroyed may belong, nor more than one hundred dollars for an animal which has no recordable pedigree; provided further, that in no case shall compensation be allowed for an animal destroyed under the provisions of this act, which may have contracted or been exposed to such disease in a foreign country, or on the high seas, or that may have been brought into this state within one year previous to such animal's showing evidence of such disease; nor shall compensation be allowed to any owner who in person, or by agent, knowingly and willfully conceals the existence of such disease, or the fact of exposure thereto in animals of which the person making such concealment by himself or agent, is in whole or part owner.

SECT. 3. That the said commissioners are hereby authorized and required to make record, and publish rules and regulations providing for and regulating the agencies, methods, and manner of conducting, and the investigations aforesaid, regarding the existence of said contagious diseases; for ascertaining, entering and searching places where such diseased animals are supposed to exist; for ascertaining what animals are so diseased, or have been exposed to contagious diseases; for making, reporting and recording descriptions of the said animals so diseased or exposed and destroyed, and for appraising the same, and for making payment therefor; and to make all other needful rules and regulations which may, in the judgment of the commissioners, be deemed requisite to the full and due execution of the provisions of this act. All such rules and regulations, before they shall become operative, shall be approved by the governor of Maine, and thereafter published in such manner as may be provided for in such regulations; and after such publication such rules and regulations shall have the force and effect of law, so far as the same are not inconsistent with this act and other laws of the state, or United States.

SECT. 4. That any person or persons who shall knowingly and willfully refuse permission to said commissioners, or either of them, or their duly constituted agent, to make, or who knowingly and willfully obstruct said commissioners, or either of them, or their duly constituted agent in making all necessary examinations of and as to animals supposed by said commissioners to be diseased as aforesaid or in destroying the same, or who knowingly attempts to prevent said commissioners, or either of them, or their duly constituted agent, from entering upon the premises and other places hereinbefore specified, where any of said diseases are by said commissioners supposed to exist, shall be deemed guilty of a misdemeanor, and upon conviction thereof, or of either of the acts in this section prohibited, shall be punished by fine not exceeding one hundred dollars, or by imprisonment not exceeding ninety days, or by both fine and imprisonment, at the discretion of the court.

SECT. 5. That any person who is the owner of, or who is possessed of any interest in any animals affected with any of the diseases named in section two of this act, or any person who is agent, common carrier, consignee, or otherwise is charged with any duty in regard to any animal so diseased, or exposed to the contagion of such disease, or any officer or agent charged with any duties under the provisions of this act, who shall knowingly conceal the existence of such contagious disease, or the fact of such exposure to said contagion, and who shall knowingly and willfully fail, within a reasonable time, to report to the said commissioners their knowledge or their information in regard to the existence and location of said disease, or of such exposure thereto, shall be deemed guilty of a misdemeanor, and shall be punishable as provided in section four of this act.

SECT. 6. That when the owner of animals, decided under the provisions of this act, by the proper authority, to be diseased, or to have been exposed to contagion, refuses to accept the sum authorized to be paid under the appraisement provided for in this act, it shall be the duty of the commissioners to declare and maintain a rigid quarantine as to the animals decided, as aforesaid, to be diseased or to have been exposed to any contagious or infectious disease, and of the premises or places where said cattle may be found, according to the rules and regulations to be prescribed by said commissioners, approved by the governor, and published as provided in the third section of this act.

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 guilty 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.

SECT. 8. That it shall be the duty of the several county attorneys to prosecute all violations of this act, which shall be brought to their notice or knowledge by any person making the complaint under oath; and the same shall be heard in any supreme judicial court having jurisdiction in the county in which the violation of this act has been committed.

SECT. 9. That the said commissioners are hereby authorized to appoint or elect one of their number as secretary of said board, who shall receive a reasonable compensation for his services during the time in which, under the provisions of this act, the services of the said commissioners shall be required. The said commissioners shall make and preserve a full record of all rules and regulations promulgated under the provisions of this act, of all payments and expenses hereunder incurred, and all other transactions performed by said commissioners in the discharge of their duties as herein provided; and the said commissioners shall, on or before the first Wednesday in January of each year, during their continuance in service, and at other times as they may deem conducive to the public interests, or as they may be required so to do by the governor of state, report to said governor full and accurate accounts of their expenditures, and other proceedings under the provisions of this act, and of the condition of said diseases, if any, in the state, to be communicated by him to the legislature. Whenever the functions of said commission shall be suspended or terminated, it shall turn over to the secretary of state all its books, papers, records, and other effects, taking his receipt therefor, and he shall remain the custodian of the same until such time as the functions of said commission may be restored.

SECT. 10. That the commissioners shall have power, and are hereby authorized to employ skilled veterinarians, and such other agents and employés as they may deem necessary to carry into effect the provisions of this act, and to fix the compensation of the person or persons so employed, and to terminate such employment at their discretion ; and they are authorized out of the moneys by this act appropriated, to make such expenditures as may be needed for the actual and necessary traveling expenses of themselves and their said employés, stationery, expenses of disinfecting premises, cars and other places, destroying diseased and exposed animals, and paying for the same, and such other expenses and expenditures as they may find to be actually necessary to properly carry into effect the provisions of this act.

SECT. 11. That the moneys appropriated by this act shall be paid over to the secretary of said commission, from time to time, as the same may be found to be needed, upon requisition made by the said commissioners, and shall be disbursed by the said secretary of said commission only upon vouchers approved by said commissioners or a majority of them. The said secretary shall before entering upon the duties of his office, take an oath to faithfully discharge the duties thereof, and shall enter into a bond to the state of Maine, with sureties to be approved by the treasurer of state, in such sum as he may designate, for the faithful accounting of all moneys received by the said secretary of the commission under the provisions of this act.

SECT. 12. That for the purpose of carrying into effect the provisions of this act, the sum of five thousand dollars, or so much thereof as may be necessary, is hereby appropriated out of any moneys in the treasury not otherwise appropriated.

SECT. 13. That all acts and parts of acts inconsistent or in conflict with the provisions of this act, be, and the same are hereby repealed.

Approved February 14.

CHAPTER 119, RESOLVES 1891.

Resolved, That the sum of twenty-five hundred dollars is hereby appropriated for carrying into effect the provisions of the law for the extirpation of contagious diseases among cattle, for the year 1891; and twenty-five hundred dollars for the year 1892, to be expended under the direction of the cattle commissioners.

AN ACT TO PREVENT FRAUD IN THE SALE OF LARD.

Chapter 244.

SECT. 1. No manufacturer or other person shall sell, deliver, prepare, put up, expose or offer for sale any lard, or any article intended for use as lard which contains any ingredient but the pure fat of swine, in any tierce, bucket, pail, or other vessel or wrapper, or under any label bearing the words "pure," "refined," "family," or either of them alone or in combination with other words unless every vessel, wrapper or label, in or under which such article is sold or exposed, delivered or prepared, put up or exposed for sale, bears on the top or outer side thereof, in plain letters not less than one-half inch in length and plainly exposed to view, the words "compound lard."

SECT. 2. Any person who violates any provision hereof, shall forfeit the sum of fifty dollars to the use of any person suing therefor, in an action of debt.

Approved March 2, 1889.

CRUELTY TO ANIMALS.

Chapter 124.

SECT. 29. Every person who cruelly over-drives, overloads, or overworks, who torments, tortures, maims, wounds, or deprives of necessary sustenance, or who cruelly beats, mutilates or kills any horse or other animal, or causes the same to be done, or, having the charge or custody thereof, as owner or otherwise, unnecessarily fails to provide such animal with proper food, drink, shelter, and protection from the weather; every person, owning or having the charge or custody of any animal, who knowingly and willfully authorizes or permits the same to suffer torture or cruelty; and every owner, driver, possessor or person having the custody of an old, maimed, disabled, or diseased animal, who cruelly works the same when unfit for labor, or cruelly abandons such animal; and every person who carries or causes to be carried, in or upon a vehicle or otherwise, any animal in a wantonly cruel or inhuman manner, shall, for every such offense, be punished by imprisonment in jail not exceeding one year, or by fine not exceeding two hundred dollars, or both.

SECT. 35. Amended 1891, chapter 25. Railroad companies within the state shall give cars containing cattle, sheep, swine or other animals a continuous passage in preference to other freight; and cars loaded with such animals at any station shall have precedence over all other freight. A greater number of animals shall not be loaded into any car than can stand comfortably therein. Animals of one kind only shall be loaded in one apartment. Young animals shall not be loaded in the same apartment with those larger and mature, in case of dams with their own and others' sucklings, which shall, in all cases, be transported in the same apartment and separate from other animals. Calves shall have free access to their dams, and shall not be muzzled. During December, January, February and March, cars used for the transportation of animals shall be sufficiently boarded on the sides and ends to afford proper protection to such animals in case of storms or severely cold weather.

SECT. 41. Any officer or agent of any society for the prevention of cruelty to animals may lawfully cause to be destroyed forthwith, any animal found abandoned and not properly cared for, appearing in the judgment of two reputable persons called by him to view the same in his presence, to be diseased or injured past recovery for any lawful purpose.

'Section 42. (As amended 1889, chapter 289.) Such officer or agent may take possession of any old, maimed, disabled, diseased or injured animal not properly cared for, and apply to any municipal or police court or trial justice for process to cause the same to be destroyed. If the owner is known, a copy of such application shall be served upon him in hand with an order of court to appear at a time and place named, to show cause why such animal should not be destroyed, and its value fixed. If the owner is not known, then the court shall order notices to be posted in two public and conspicuous places in the town, stating the case in substance, and giving forty-eight hours notice of the hearing thereon. At such hearings, the court shall determine the value of such animal, and may issue process directing such officer to destroy the same. The defendant may appeal as in civil actions.'

SECT. 43. Such officer or agent may lawfully interfere to prevent the perpetration of any act of cruelty upon an animal in his presence and whoever interferes with or obstructs such officer or agent in the discharge of his duty is guilty of a misdemeanor.

SECT. 44. Any person may take charge of an animal whose owner has cruelly abandoned it or cruelly fails properly to take care of and provide for it, and may furnish the same with proper shelter, nourishment and care, at the owner's expense, and have a lien thereon for the same.

SECT. 46. (Amended 1891, chapter 93.) Upon application by the mayor and aldermen of any city, the selectmen of any town, or the president and any three directors of any such company, the governor and council shall issue a badge and commission to any person designated, to arrest any person charged with violating any of the preceding seventeen sections the same as any sheriff, deputy sheriff or constable can do, and whose jurisdiction shall extend throughout the state.

SECT. 47 (As amended 1885, chapter 364). Municipal and police courts and trial justices shall, on complaint, cause to be arrested, persons charged with the commission, in their counties, of any of the offences described in the eighteen preceding sections; and when such offences are not of a high and aggravated nature, may try and punish by fine not exceeding twenty dollars, and by imprisonment not exceeding thirty days; but when, on examination, the offence appears to be one not within their jurisdiction for trial, they may cause the person or persons charged with the commission of the same to recognize with sureties to appear before the supreme judicial court or superior court, and in default thereof, except in case of corporations, to be committed to jail.

MALICIOUS MISCHIEF AND TRESPASSES.

Chapter 127.

SECT. 1. Whoever willfully or maliciously kills, wounds, maims, disfigures, or poisons any domestic animal, or exposes any poisonous substance with the intent that the life of such animals should be destroyed thereby, shall be punished by imprisonment for not more than four years, or by fine not exceeding five hundred dollars.

SECT. 2. Whoever unlawfully, willfully, and with intent to injure the owner, takes away any horse, saddled, or harnessed, or attached to a vehicle, and standing in any highway or other place, shall be punished by fine not exceeding one hundred dollars, or imprisonment in jail for not more than three months.

SECT. 11. Whoever willfully commits any trespass, or knowingly authorizes or employs another to do so, by entering the garden, orchard, pasture, cranberry ground, or improved land, of another with intent to take, carry away, destroy, or injure trees, shrubs, grain, grass, hay, fruit, vegetables, turf or soil thereon, shall be punished by fine not exceeding twenty dollars, and imprisonment for not more than thirty days.

LIENS.

Chapter 91.

SECT. 40. Lien on canned goods. Whoever furnishes corn or other grain or fruit for canning or preservation otherwise, has a lien on such preserved article, and all with which it may have been mingled, for its value when delivered, including the cans and other vessels containing the same, and the cases, for thirty days after the same has been delivered, and until it has been shipped on board a vessel or laden in a car, which lien may be inforced by attachment within that time.

'Section 41. As amended 1887, chapter 1. Whoever pastures, feeds or shelters animals by virtue of a contract with or by consent of the owner, has a lien thereon for the amount due for such pasturing, feeding or sheltering, to secure payment thereof with costs, to be enforced in the same manner as liens on goods in possession and choses in action.'

AN ACT CREATING A LIEN ON COLTS.

SECT. 1. A lien is hereby created on all colts hereafter foaled in this state, to secure the payment of the service fee, for the use of the stallion begetting the same. Such lien is to continue in force until the foal is five months old, and may be enforced during that time by attachment of such foal.

SECT. 2. Section forty-two of chapter ninety-one of the revised statutes, is hereby made applicable to suits brought to enforce the above lien.

AN ACT TO PROTECT THE BREEDERS OF BLOODED ANIMALS AGAINST FRAUDULENT REGISTRATION AND MISREPRESENTATION.

Every person who, by any false pretence, shall obtain from any club, association, society or company for improving the breed of cattle, horses, sheep, swine or other domestic animals, the registration of any animal in the herd register or other register of any such club, association, society or company, or a transfer of any such registration, and every person who shall knowingly exhibit, make or give a false pedigree of any animal, upon conviction thereof shall be punished by imprisonment for a term not exceeding ninety days in the county jail, or by a fine not exceeding three hundred dollars, or by both such fine and imprisonment.

AN ACT FOR THE PROTECTION OF PATRONS OF AGRICULTURAL FAIRS.

SECT. 1. The receipts of the Maine State Agricultural Society, the Eastern Maine State Fair and all county agricultural societies, are hereby exempted from attachment, trustee process and seizure on execution until current expenses of the fair, purses and premiums awarded by the society are paid, provided that the same are paid within three months from the close of the fair.

SECT. 2. This act shall take effect when approved.

AN ACT TO CARRY INTO EFFECT AN ACT OF CONGRESS ENTITLED "AN ACT TO ESTABLISH AGRICULTURAL EXPERIMENT STATIONS IN CONNECTION WITH COLLEGES IN THE SEVERAL STATES."

SECT. 1. For the purpose of carrying into effect the provisions of an act of the congress of the United States, approved March two, eighteen hundred and eighty-seven, to establish agricultural experiment stations in connection with the colleges established in the several states, under the provisions of an act approved July two, eighteen hundred and sixty-two, and of the acts supplementary thereto, the state hereby assents to the purposes of said grants and accepts the grants of money authorized and appropriated by said first named act approved March two, eighteen hundred and eighty-seven, and assigns the same to the Maine State College of Agriculture and the Mechanic Arts, and there is hereby established at said college in connection therewith, and under its direction, a department to be known and designated as the Maine Agricultural Experiment Station.

SECT. 2. The act of the legislature of this state, approved March three, eighteen hundred and eighty-five, establishing the Maine Fertilizer Control and Agricultural Experiment Station, is hereby repealed, this repeal to take effect October one, eighteen hundred and eighty-seven.

SECT. 3. All apparatus, chemicals and other property belonging to said station, and the unexpended balance of money in the state treasury appropriated by the state to said station, for the year eighteen hundred and eighty-seven, shall, on October one, eighteen hundred and eighty-seven, be transferred and paid to and become the property of the Maine State College of Agriculture and the Mechanic Arts, and the treasurer thereof shall receipt for the property so transferred by the board of managers of said experiment station, and the unexpended balance so paid over by the treasurer of state.

AN ACT TO ESTABLISH A STANDARD WEIGHT OF A BARREL OF POTATOES.

SECT. 1. The standard weight of a barrel of potatoes, in good order and fit for shipping, is one hundred and sixty-five pounds.

SECT. 2. Whoever, acting for himself or as the employe of another, takes more than the standard weight for a barrel of potatoes, shall forfeit fifty cents for each barrel, to the person prosecuting therefor, within thirty days.

AN ACT TO ESTABLISH THE LEGAL WEIGHT OF A BUSHEL OF HERDSGRASS SEED.

SECT. 1. The standard and legal weight of a bushel of herdsgrass seed, when well cleaned and in good condition, is forty-five pounds.

RESOLVE IN AID OF DAIRYING, BEEF RAISING, SHEEP, HORSE AND POULTRY GROWING INTERESTS OF THE STATE OF MAINE.

Chapter 160. Resolves 1889.

Resolved, That the sum of one thousand dollars be and is hereby appropriated annually for the Maine State Agricultural Society, and one thousand dollars annually to the Eastern Maine State Fair, provided, that each of said societies appropriate an amount equal to the sum herein appropriated, and in addition thereto for premiums to the classes mentioned in this resolve. Provided also, that each of said societies shall cause the prohibitory liquor law to be enforced on all grounds over which they have control, and not allow gambling in any form or games of chance on said grounds. Four hundred dollars of said appropriation shall be used annually by each society for the purpose of encouraging the dairying interests in this state. Five hundred dollars for purpose of encouraging the raising of cattle in this state. Five hundred dollars for the purpose of encouraging the growing of horses in this state. Three hundred dollars for the purpose of encouraging the growing of sheep in this state.

One hundred and fifty dollars for the purpose of encouraging the growing of swine in this state, and one hundred and fifty dollars for the purpose of encouraging the growing of poultry in this state. These several sums shall be offered by the said societies in special premiums to be competed for by the citizens of this state only. A list of premiums shall be arranged jointly by the executive officers of the two said societies, together with the president and secretary of the board of agriculture. All premiums awarded shall be paid in full and said societies may draw said appropriations by the state upon their vouchers only so far as said premiums have been awarded and paid in full by them.

PREVENTION OF FIRES.

Chapter 26.

SECT. 14. No person shall enter any mill, factory, machine shop, ship yard, covered bridge, stable or other building, with a lighted pipe or cigar, or shall light or smoke any pipe or cigar therein, under a penalty of five dollars, if a notice in plain legible characters that no smoking is allowed therein, is kept in a conspicuous position over or near each principal entrance to such building or place; and whoever defaces, removes, or destroys such notice, forfeits ten dollars.

SECT. 15. Whoever kindles a fire, on land not his own, without consent of the owner, forfeits ten dollars; if such fire spreads and damages the property of others, he forfeits not less than ten nor more than five hundred dollars; and, in either case he shall stand committed until fine and costs are paid.

SECT. 16. Whoever with intent to injure another, causes a fire to be kindled on his own or another's land, whereby the property of any other person is injured or destroyed, shall be fined not less than twenty, nor more than one thousand dollars, or imprisonment not less than three months, nor more than three years.

SECT. 17. Whoever for a lawful purpose kindles a fire on his own land, shall do so at a suitable time and in a careful and prudent manner; and is liable, in an action on the case, to any person injured by his failure to comply with this provision.

SECT. 18. Persons engaged in driving lumber may kindle fires when necessary, but shall use the utmost caution to prevent them from spreading and doing damage, and if they fail so to do, they are subject to all the foregoing liabilities and penalties, as if said privilege had not been allowed.

WOOD AND BARK.

Chapter 41.

SECT. 1. Towns may, by ordinance, regulate the measure and sale of wood, coal, and bark, therein, and the location of teams hauling the same; and may enforce it by reasonable penalties. All cord wood exposed for sale shall be four feet long including half the scarf, and well and closely laid together; a cord of wood or bark shall measure eight feet in length, four feet in width, and four feet in height, or otherwise contain one hundred and twenty-eight cubic feet; and the measurer shall make due allowance for refuse or defective wood, and bad stowage.

SECT. 2. If any fire wood or bark, brought into any town by land, is sold and delivered, unless otherwise agreed to by the purchaser, before it is measured by a sworn measurer, and a ticket signed by him and given to the driver, stating the quantity that the load contains, the name of the driver, and the town in which he resides, such wood and bark is forfeited, and may be libelled and disposed of according to law.

SECT. 3. All cord wood brought by water into any town for sale, shall be corded on the wharf or land, on which it is landed in ranges making up in height what is wanting in length; then it shall be so measured and a ticket given to the purchaser, who shall pay the stated fees; and no such wood shall be carried away by any wharfinger or carter, before it has been so measured, under a penalty of one dollar for every load.

SECT. 5. When any wood, bark, or charcoal, sold by the cord, foot, or load, is so stowed as to prevent the surveyors from examining the middle of the load, and it appears on delivery, that it was stored with a fraudulent intent of obtaining payment for a greater quantity than there was in fact, the seller or owner thereof forfeits ten dollars to the county.

RELATING TO QUALIFICATIONS OF INSTRUCTORS IN PUBLIC SCHOOLS. REVISED STATUTES, CHAPTER 11 AMENDED 1891, SECTION 7, SPECIFICATION 2.

II. On satisfactory evidence that a candidate possesses a good moral character, and a temper and disposition suitable to be an instructor of youth, they shall examine him in reading, spelling, English grammar, geography, history, arithmetic, book-keeping and physiology; and the elements of natural sciences, especially as applied to agriculture, and such other branches as they desire to introduce into public schools, and particularly into the school for which he is examined; also as to his capacity for the government thereof.

Approved February 25, 1891.

DIVISION FENCES.

Chapter 22, to Section 15.

SECT. 1. All fences four feet high and in good repair, consisting of rails, timber, boards, stone walls, iron or wire; and brooks, rivers, ponds, creeks, ditches and hedges, or other things which, in the judgment of the fence viewers having jurisdiction thereof are equivalent thereto, are legal and sufficient fences; *provided, however*, that no barbed wire fence built since April 15, eighteen hundred and eighty-three, shall be accounted legal and sufficient, unless it is protected by an upper rail of board of wood.

SECT. 2. The occupants of lands enclosed with fences shall maintain partition fences between their own and the adjoining enclosures, in equal shares, while both parties continue to improve them.

SECT. 3. If any party neglects or refuses to repair or rebuild any such fence, which he ought to maintain, the aggrieved party may complain to two or more fence viewers in the town where the land is situated, who after due notice to such delinquent, shall proceed to survey it, and if they determine that it is insufficient, they shall signify it in writing to the delinquent occupant, and direct him to repair or rebuild it within such time as they judge reasonable, not exceeding thirty days. If the fence is not repaired or rebuilt accordingly, the complainant may make or repair it.

SECT. 4. When the complainant has completed such fence, and after notice given, it has been adjudged sufficient by two or more of the fence viewers, and the value thereof, with the fence viewers fees, certified under their hands, he may demand of the occupant or owner of the land, where the fence was deficient, double the value and fees thus ascertained; in case of neglect or refusal for one month after demand, he may recover the same by an action on the case, with interest at the rate of one per cent a month, and if the delinquent owner, or occupant repairs or rebuilds such fence without paying the fees of the fence viewers, certified by them, double the amount thereof may be recovered by the complainant as herein provided.

SECT. 5. When the occupants or owners of adjacent lands disagree respecting their rights in partition fences and their obligation to maintain them, on application of either party, two or more fence viewers of the town where the lands lie, after reasonable notice to each party may in writing under their hands assign to each his share thereof, and limit the time in which each shall build or repair his part of the fence, not exceeding thirty days. Such assignment and all other assignments of proprietors of partition fences herein provided for, recorded in the town clerk's office, shall be binding upon the parties, and they shall hereafter maintain their part of said fence. If such fence has been built and maintained by the parties in unequal proportions, and the fence viewers adjudge it to be good and sufficient, they may, after notice as aforesaid, in writing under their hands, award to the party who built and maintained the larger portion, the value of such excess, to be recovered in an action on the case against the other party, if not paid within six months after demand. Parties to assignments under the provisions hereof shall pay the fees of the fence viewers certified under their hands, in equal proportions, and if either party neglects to pay his proportion within one month after demand, the party applying to the fence viewers may pay the same and recover of said delinquent party, in an action on the case double the amount of his said proportion thereof.

SECT. 6. If any party refuses or neglects to build and maintain the part thus assigned to him, it may be done by the aggrieved party; who is entitled to double the value and expenses, to be ascertained, and recovered as provided in section four, and shall have a lien therefor on the land owned or occupied by the party neglecting or refusing to build or maintain the partition fence assigned to him by the fence viewers, to be enforced by attachment made within one year from the day of division by them.

SECT. 7. All division fences shall be kept in good repair throughout the year, unless the occupants of adjacent lands otherwise agree.

SECT. 8. When in the opinion of the fence viewers having jurisdiction of the case, if it is, by reason of natural impediments, impracticable or unreasonably expensive to build a fence on the true line between adjacent lands, and the occupants disagree respecting its position, on application of either party as provided in section five, and after notice to both parties, and a review of the premises, they may determine, by a certificate under their hands communicated to each party, on which side of the true line, and at what distance, or whether partly on one side and partly on the other, and at what distances, the fence shall be built and maintained, and in what proportion by each party; and either party may have the same remedy against the other, as if the fence were on the true line.

SECT. 9. When adjacent lands have been occupied in common without a partition fence, and either party desires to occupy his in severalty, or when it is necessary to make a fence running into the water, and the parties liable to build and maintain it disagree, either party may apply to the fence viewers of the town, who shall proceed as in section five; except that the fence viewers may allow longer than thirty days for building the fence, having regard to the season of the year. In other respects the remedy shall be as there provided.

SECT. 10. When one party ceases to improve his land, or lays open his enclosure, he shall not take away any part of his partition fence adjoining the next enclosure improved, if the owner or occupant thereof will pay therefor what two or more fence viewers on due notice to both parties determine to be its reasonable value.

SECT. 11. When any land, which has been unclosed, is afterwards enclosed, or used for pasturing, its occupant or owner shall pay for one-half of each partition fence on the line between his land and the inclosure of any other occupant or owner, and its value shall be ascertained in writing; if the parties do not agree, by two or more of the fence viewers of the town where such fence stands; and after the value is so ascertained, on notice to such occupant or owner, if he neglects or refuses for thirty days, after demand, to pay it, the proprietor of the fence may have an action on the case for such value and the cost of ascertaining it.

SECT. 12. If a line on which a partition fence is to be made or to be divided, is the boundary between two or more towns, or partly in one town and partly in another, a fence viewer shall be taken from each town.

SECT. 13. When a fence between owners of improved lands is divided either by fence viewers, or by the written agreement of the parties recorded in the town clerk's office where the land lies, the owners shall erect and support it accordingly; but if any person lays his lands common, and determines not to improve any part of them adjoining such fence, and gives six months notice to all occupants of adjoining lands, he shall not be required to maintain such fence while his land so lies common and unimproved. But all partition fences divided by parol agreement and actually built in pursuance of such agreement, including fences so built heretofore, shall be deemed legal fences as if divided by fence viewers or written agreement, and the adjoining owners shall support their respective portions of fence under such agreement, until otherwise ordered by the fence viewers, on application to them by either party. And when a party has constructed his part of a fence in pursuance of a parol or written agreement or assignment of fence viewers, no assignment shall thereafter be made by fence viewers, depriving him of the full value of such fence or any part thereof.

SECT. 14. Nothing herein extends to house lots, the contents of which do not exceed half an acre; but if the owner of such lot improves it, the owner of the adjacent land shall make and maintain one half of the fence between them whether he improves or not; nor does this chapter make void any written agreement respecting public fences.

POUNDS AND IMPOUNDING BEASTS.

Chapter 23

SECT. 1. Each town shall constantly keep and maintain in such place as the inhabitants direct, one or more sufficient pounds for the reception of beasts liable by law to be impounded; and for six months' neglect so to do, forfeits not less than fifty dollars, to be expended by an agent appointed by the court to build or maintain such pounds.

SECT. 2. For every horse, horse kind, ass, mule, swine or neat beast found at large without a keeper in the highways, town ways, or commons of the town, the owner forfeits seventy-five cents, twenty-five cents for each goat, and ten cents for each sheep so found, recoverable in an action of debt; or the beasts may be impounded until such forfeiture with the charges of impounding and keeping them, and all fees, are paid by the owner or claimant.

SECT. 3. If such horse is an ungelded male one year old or upwards, his owner forfeits a further sum of four dollars. If any ram or he-goat is found going at large out of the owner's enclosure, between the tenth day of August and the twentieth day of November, his owner forfeits a further sum of five dollars.

SECT. 4. Any person injured in his land by sheep, swine, horses, asses, mules, goats, or neat cattle, in a common or general field, or in a close by itself, may recover his damages by distraining any of the beasts doing it, and proceeding as hereinafter directed, or in an action of trespass against the person owning or having possession of the beasts at the time of the damage, and there shall be a lien on said beasts, and they may be attached in such action and held to respond to the judgment as in other cases, whether owned by the defendant or only in his possession. But if the beasts were lawfully on the adjoining lands, and escaped therefrom in consequence of the neglect of the person suffering the damage to maintain his part of the partition fence, their owner shall not be liable therefor.

SECT. 5. Each town shall annually choose a pound keeper for each pound therein, who shall be sworn, and before he acts, shall give bond with sureties satisfactory to the municipal officers, for the faithful discharge of his duties; and the town shall be responsible for all his illegal doings or defaults, to the party injured, in an action on the case.

SECT. 6. Each poundkeeper, in a book provided by the town, shall record at length all certificates received from persons committing beasts to the pound, or finding stray beasts, and a single copy of all advertisements by him posted or published; and shall note therein when a beast was impounded, and when and by whom taken away, and all his proceedings in the impounding and sale specified in section thirteen, the price for which said beast was sold, the name of the purchaser, and the disposal of the proceeds of sale; a copy of said record attested by him or his successor shall be evidence for the purchaser of his title to said beast, and of the truth of all the facts thus recorded; for making such record, and for each copy thereof, the poundkeeper shall receive twenty-five cents; and said book shall be delivered to his successor in office, and be open to the inspection of all persons interested.

SECT. 7. The poundkeeper shall restrain the beasts impounded in the town pound, or after the first day, in such other place as is more comfortable, or safe, and more convenient for food and drink; which shall be furnished them by him at the expense of the impounder. Unless payment is made in advance, or sufficient security therefor rendered, he need not receive such beasts into pound.

MISCHIEVOUS DOGS.

Chapter 30.

SECT. 1. Towns may pass by-laws to regulate the going at large of dogs therein. When a dog does damage to a person or his property, his owner or keeper, and also the parent, or guardian, master, or mistress, of any minor or servant, who owns or keeps such dog, forfeits to the person injured double the amount of the damage done; to be recovered by action of trespass.

SECT. 2. Any person may lawfully kill a dog, that suddenly assaults him or another person when peaceably walking or riding, or is found worrying, wounding, or killing any domestic animal, outside of the inclosure or immediate care of his owner.

SECT. 3. Whoever is so assaulted or finds a dog strolling out of the inclosure or immediate care of his master, may, within forty-eight hours thereafter, make oath before a justice of the peace that he really suspects such dog to be dangerous or mischievous, shall notify his master by giving him a copy of said oath, signed by the justice; and if the master neglects for twenty-four hours thereafter, to confine or kill such dog, he forfeits five dollars to any prosecutor; and if such dog is again at large out of the care of his master, any person may lawfully kill him.

SECT. 4. If a dog, after notice so given, wounds any person by a sudden assault as aforesaid, or wounds or kills any domestic animal, the owner or keeper shall pay the person injured treble damages and costs.

DESTRUCTION OF BIRDS AND EGGS.

Chapter 249.

'Section 23. (As amended 1889.) Whoever kills or has in his possession, except alive, any birds commonly known as larks, robins, swallows, sparrows or orioles, or other insectivorous birds, crows, english sparrows and hawks excepted, forfeits not less than one dollar, nor more than five dollars, for each such bird killed, and the possession by any person of such dead bird, is prima facie evidence that he killed such bird.'

SECT. 24. Whoever at any time wantonly takes or destroys the nest, eggs, or unfledged young of any wild bird, except crows, hawks, and owls, or takes any eggs or young from such nest, except for the purpose of preserving the same as specimens, or of rearing said young alive, forfeits not less than one dollar nor more than ten dollars for each nest, egg, or young so taken or destroyed.

AN ACT TO MAKE RAMSHACKLE PARK ASSOCIATION A BENEFICIARY, UNDER THE LAW PAYING STIPENDS TO AGRICULTURAL SOCIETIES.

Chapter 524, Laws of 1889.

SECT. 1. The Ramshackle Park Association of York County shall be paid the fair share of the annual stipends provided by law for agricultural societies, subject to the conditions imposed by law.

SECT. 2. This act shall take effect when approved.

Approved March 7, 1889.

LAWS 1891, CHAPTER 315, SECTION 1.

An act to repeal chapter 173-1879 entitled an act establishing tuition at the State College of Agriculture and Mechanic Arts.

AN ACT AUTHORIZING THE NEW ENGLAND LIVE STOCK INSURANCE COMPANY TO DO BUSINESS IN MAINE.

Private and Special Laws, 1891, Chapter 327, Section 1.

The New England Live Stock Insurance Company, a corporation chartered by special act of the legislature of Massachusetts in the year eighteen hundred and eighty-eight, may be licensed by the insurance commissioner to transact live stock insurance business in this state under chapter two hundred and thirty-seven of the Public Laws of eighteen hundred and eighty-nine, and shall be authorized to transact such business upon compliance with the provisions of said act, so far as relates to the admission of companies of other states, excepting so much of said act as relates to the accumulation of a reserve fund, also excepting any provisions thereof not applicable to live stock insurance.

SECT. 2. Said company shall deposit quarterly in the months of March, June, September and December of each year in its name in such trust company or national bank in this state as the insurance commissioner shall designate, all moneys received by it for its mortuary fund from policy-holders in this state. Such deposits shall be withdrawn in such form and manner as said company and the commissioner shall determine, and be used only for the purpose of paying losses occurring in this state, so long as any liability to any policy-holder in this state exists, but such losses shall be paid by the company when they become due whether said deposits are sufficient to pay them or not.

SECT. 3. The insurance commissioner is hereby authorized to revoke, either temporarily or permanently, the authority granted by this act whenever on investigation, he is satisfied that said company has failed to comply with the provisions of this act or has unreasonably neglected to pay lawful claims of its policy holders in this state.

Approved April 2, 1891.

AN ACT TO ACCEPT THE PROVISIONS OF AN ACT OF CONGRESS, AS APPROVED AUGUST THIRTY, 1890, RELATING TO THE ENDOWMENT AND SUPPORT OF THE COLLEGE FOR THE BENEFIT OF AGRICULTURE AND MECHANIC ARTS.

Private and Special Laws, 1891, Chapter 23, Section 1.

That the provisions of an act of Congress of the United States, approved August thirty, eighteen hundred and ninety entitled, "An act to apply a portion of the proceeds of the public lands to the more complete endowment and support of the college for the benefit of Agriculture and the Mechanic Arts," established under the provisions of an act of Congress approved July second, eighteen hundred and sixty-two, is assented to and accepted, and the treasurer of said college is hereby authorized to receive and receipt for the same.

Approved February 5, 1891.

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